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A. A. Gray, General Manager. H. S. Tuthill, Business Manager.
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THE CONVENTION OF THE OHIO ELECTRIC LIGHT ASSOCIATION.

The twenty-first annual convention of the Ohio Electric Light Association, which was held at Cedar Point last week, added another to the long list of successful meetings which have been staged by this progressive state association. While the attendance was not quite up to the figure of last year, it was, nevertheless, sufficient to make a very successful meeting. As has been usual in recent years, there were no exhibits in connection with the convention. The program of the business sessions consisted largely of the reports of committees, and these with the discussion upon them brought out many points of interest. The Committee on Transmission and Distribution also arranged for a demonstration of line work which was very instructive and naturally leads to the suggestion that similar demonstrations might be arranged as a regular feature, as they are much more interesting and instructive than the ordinary type of exhibit which has been customary in the past.

One of the prominent topics at this convention was the attitude of the utility corporations towards the public and the means which should be utilized to secure good will, which is so necessary to the permanent success of any utility corporation. This matter was fully discussed in our last issue. The address by the Honorable Beecher W. Waltermier, chairman of the Public Utilities Commission of Ohio, was a feature of the convention, and indicated that the attitude of the present commission is one insuring a fair hearing to the utilities and an intention to do justice to them in all cases that may come up before the Commission.

The weather during the convention was delightful, in spite of a few showers which were experienced, and was in pronounced contrast to the sweltering days which have usually been experienced by those attending the convention at Cedar Point. The entertainment features were successfully carried out and added greatly to the enjoyment of the members and guests present.

It is to be noted, however, that the summer convention of the Ohio Electric Light Association no longer represents the principal part of its activities. The meetings which are arranged throughout the year by the various committees probably accomplish more than their reports made at the annual convention, as they permit attendance and participation in

the work by many who are not able to attend the summer convention. The work of other committees, such as those on accounting and appraisals, are of wide benefit to the members of the Association, and the benefit derived from these would alone make membership in the Association worth while. In addition, the monthly publication which has been successfully launched by the Association serves to keep the members in touch with the cases coming before the Utilities Commission, with legislative matters which are under consideration at the state capital, and other matters of general interest to the members. We are pleased to note that this publication is upon a self-sustaining basis and that the financial condition of the Association is the best that has been reported for some years.

OVERALL EFFICIENCY IN STREET LIGHTING.

The gas-filled tungsten lamp and the magnetite or luminous form of arc lamp are so nearly on a par with respect to both cost and general satisfaction that it is necessary to discriminate very carefully and examine very closely into all aspects of their use in order to determine which will prove best fitted to the needs of any particular case. In this connection it is well to bear in mind that efficiencies as usually stated are not a sufficient guide to determine the actual relation between the amount of power expended and the useful flux of light received from the lamp.

Not only is the shape of the distribution curve, showing the amounts of light emitted in different directions from the lamp, of the greatest importance, but the effect of the accessories used with the lamp are quite as important as the efficiency of the bare lamp itself. The modifications produced in the consumption of power for a given quantity of light flux as well as in the distribution of this light by the use of diffusing globes, reflectors, or other equipments are quite as important as the original efficiency of the bare lamp itself.

In making comparisons of the efficiency of different lamps, consequently, it should be done upon the basis of the overall efficiencies of lamps with their accessories in position: in other words, under the actual conditions of operation. Moreover, the effect of accumulation of dust, and the frequency of cleaning required, should be taken into consideration. Only a comparison on this basis will enable the engineer to make a proper determination of the desirability of any particular lamp, or advantages and relative economies of those being considered for any installation.

ELECTRICAL EXPORTS.

The volume of the electrical exports for May, reported elsewhere in this issue, shows a decrease with respect to the previous month, but has only been exceeded by the one month of April since the previous May. This, on the surface, seems to indicate that trade conditions in the electrical industry, so far as export business is concerned, are approaching normal. Such an inference may, however, be entirely misleading, as many readjustments have been made since the outbreak of the European war, and the materials exported are not traversing the same paths nor reaching the same territory as in normal times.

For instance, electrical exports to England are normally small, the latter country purchasing much more extensively from Germany in times of peace. In May, 1915, however, this country sent to Great Britain electrical goods valued at $898,000, or over three times as much as in May, 1914. Moreover, this represents nearly half the electrical exports for the month. It will be evident, then, that trade with other countries is far from normal, and the total figures are only kept up by emergency orders due to the war. These are concerned largely with wire and cables, while the figures for heavy machinery have experienced a decided slump. It is to be noted also that since the German supply has been cut off, the exports of metal-filament lamps from the United States show a steady increase.

It is obvious that any change in the present conditions will again modify the avenues of trade, and as the present conditions may be altered at any time, another readjustment must be anticipated before business settles down to a steady supply of normal proportions to meet a permanent demand.

ELECTRIC SERVICE ON THE FARM.

For many years there has been agitation of the desirability of using electricity on the farm. At first this was directed principally to the use of electric lighting; as the development of motor drive to farm machinery was perfected and the adaptability of various electrical devices was found to be serviceable on the farm, the use of electricity for all of these purposes has been advocated. There is but little argument presented against the use of electricity on the farm. It is realized that aside from possible economy it will materially aid in making farm life more comfortable and attractive, and therefore help to keep the young folks from augmenting the population in our already congested cities. Everything that can be done to promote the conveniences and pleasures of rural life should be encouraged; therefore, that which promotes the more general use of electricity on the farm should be given careful consideration.

Conceding that electric service is highly desirable on the farm, the question is how shall it be provided? Until some five or six years ago there was but one solution to this question, namely, the installation of an isolated generating plant, which necessarily involved considerable expense and troublesome attention. In the last few years, however, there has been a very marked advance in the design and manufacture of line equipment which is suitable for outdoor use on even very high voltages. This development has shown in numerous cases, where construction of farm lines has been actively carried out, that such lines not only can

be built, but can be operated very advantageously under many conditions. These developments have made it necessary to consider very carefully whether the provision of electric service on the farm shall be by means of an isolated plant or by means of a distribution system connected with some extensive electric supply network.

During the last few years also there have been marked developments in the design and manufacture of small engine-driven generating sets, mostly employing gasoline engines either directly or belt-connected to a generator, with which a storage-battery auxiliary is usually provided. In most cases these plants are designed to have fairly simple control, the switchboard containing but few instruments and a relatively small number of switches; in other cases it has been thought desirable to make the equipment as nearly automatic as possible, which involves a number of relays and automatic switches for insuring proper operation of the various parts of the equipment. The variety of these generating plants is very great and, although some of them have been designed and built in what appears to be a crude manner, nevertheless there seems to be a demand for equipments of even this type, since the investment is usually desired to be small. Some of the plants have been designed to give very satisfactory service as regards reliability and also as regards the cost of operation. That there is an important field for the various types of these isolated plants cannot be questioned, because there probably will remain for a great many years to come many farms so situated that to supply them from an electric transmission or distribution system would be practically out of the question. In these cases the installation of such a plant enables the farmer to secure the many advantages of electric service that would otherwise be denied him.

That many of these plants are being installed and will continue to be used on farms that can be served much more advantageously from a central-station system is also certain. There are a number of reasons for this, one being the conservatism of many central-station executives when it comes to the matter of extensions into rural districts. Another is that many of the plants in small towns are operated by the municipal authorities who are restricted to serve within the limits of their own community. Without mentioning other reasons, it may be well to point out that in the numerous districts where rural-line development has made considerable headway it has been found that under proper conditions the supply of electricity to the farmers from central-station lines is mutually advantageous to the farmers and to the electric companies. It should be remembered that electricity is used not merely for lighting, but that on the farm in particular it finds many applications for driving machinery and for relieving the drudgery of the farmer's wife, which insures that the load on the average farm will be much greater than that in the average residence. Most of the isolated plants that are going into farm use are designed primarily as electric lighting plants, their generating capacity being usually so limited as to prohibit the use of much power, heating, or other electric load. The investment in a generating plant of ample capacity to provide electric service on the largest possible scale would be so heavy as to be prohibitive. Most of the isolated generating plants are built for low voltage, 32 volts being particularly favored; if such a plant is to be discarded on account of difficulties in operation and central-station service with standard voltage is to be supplied later, rewiring will be necessary in many cases, making the conversion expensive.

Some central-station men are actively encouraging the installation of these isolated farm lighting plants in the belief that in the short time that they are giving fairly good service they will create such a demand for use of electricity that it will be easy to secure many farmers as central-station customers when they are ready to discard the plants as they become troublesome. This argument, while it seems to have a certain element of truth, is a fallacious one from the standpoint of economy. The investment by the farmer in a plant which is giving him inferior service will be practically a dead loss because the scrap value of the plant when it is discarded will probably be very low. Why should not the farmer be encouraged to co-operate with the central-station company to the extent, partially at least, that he would invest in his own isolated plant? By having the farmers pay part of the cost of the line construction, the chief bugaboo against serving them from a central-station system vanishes. The amount to be advanced by the farmer depends upon the situation. If the farms are small and closely adjoining, practically nothing need be advanced because the density of load per mile of line will then be fairly high. As density of load per mile diminishes, the amount to be advanced by the farmer must be increased. A number of central-station companies have made it a practice to accept such advances from farmers as absolute donations and others have arranged to reimburse the farmers as the density of load increases and makes the line more profitable. At any rate, even under quite adverse conditions, if the farmer is properly approached on the subject and it is explained to him how central-station supply eliminates his investment in an isolated plant, he will usually be ready to contribute freely to the cost of the line which makes it possible for him to get the advantages of electricity.

It should be apparent to any wide-awake central-station man that, unless he lays out a broad-gauge policy on the matter of rural lines, which will encourage the supply of electricity to practically every farmer in his district, he will find, as he ultimately does reach the point when he practically must make the investment in rural lines, that farmers will in many cases be provided with such well equipped and satisfactorily operating isolated generating plants that they will not be willing to become central-station customers. Every farm lighting plant now going in where the supply of central-station service is at all practical means so much less load on the line when it must be built.

Western Electric Employees Meet Disaster.

On the morning of Saturday, July 24, several hundred employees of the Hawthorne plant of the Western Electric Company, with many members of their families and a great number of friends, met death in an accident on the Chicago River. Five boats had been chartered in connection with the annual excursion of the employees of the big plant at Hawthorne. The destination was to have been Michigan City, Ind., a short sail across Lake Michigan. The first boat to be loaded, the lake steamer *Eastland,* was preparing to leave the dock at the foot of North Clark Street, with 2,700 passengers aboard, when it suddenly turned over and buried its side in the Chicago River. Despite the most heroic efforts of many willing rescuers immediately upon the scene of the accident, between eleven and twelve hundred men, women and children were drowned.

The city police and fire departments, aided by a corps of divers, worked unremittingly for several days until all bodies were removed from the hull of the vessel. The big commission houses along the river front turned their warehouses into emergency hospitals, and many business offices nearby were converted into relief stations. The big department stores sent van loads of blankets to the scene and gave over their motor trucks for the transportation of the dead to the Second Regiment Armory, which was used for a morgue pending identification. The Chicago Telephone Company performed a notable service in establishing centers of communication at the offices of the big daily newspapers, and in handling toll connections relating to information respecting the news of the disaster. The dailies prepared in noticeably short time authentic lists of recovered and lost, and so well was the work of identification carried forward that of 900 odd bodies recovered, only a few remained unclaimed on Monday morning. The Commonwealth Edison Company had a large crew at work on the hull of the vessel and a force of lungmotors in operation within a few minutes after the accident occurred. Strings of incandescents were installed, so as to facilitate night work and a battery of searchlights were trained from the roofs of nearby buildings.

H. B. Thayer, president, and H. A. Halligan, vice-president, of the Western Electric Company, left New York immediately upon receipt of news of the accident and arrived in Chicago early Sunday morning. The entire engineering and office staffs of the company were placed at the disposal of the authorities for co-operation in the relief of distress. Mr. Thayer authorized the donation of $100,000 to the emergency relief fund, which have been added to by business organizations and private citizens of the city of Chicago, so that a fund of at least $350,000 was available by Tuesday evening. It is expected that not less than $500,000 will be contributed during the week. No assistance from outside the city has been accepted.

So far as can be learned, no members of the office or engineering forces were involved.

Both city and federal authorities are conducting investigations to establish the causes of the accident and to place the responsibility therefor.

Electrical Exports for May.

The following data on the electrical exports of the United States for May are obtained from the official government report on the foreign commerce of that month issued by the Bureau of Foreign and Domestic Commerce.

Although the May electrical total is nearly 12.5 per cent below that of the preceding month, it is higher than any other month since May, 1914, which exceeded it by over 11 per cent. For the four classes for which the number of articles shipped is reported, there were sent during last May the following: electric fans, 2,013; arc lamps, 46; carbon-filament lamps, 60,496; metal-filament lamps, 257,104.

The following table gives the detailed figures for the various electrical classes reported, together with the comparative figures for the corresponding month of last year.

Articles.	May, 1915	May, 1914
Batteries	$ 79,618	$ 57,311
Dynamos or generators	84,153	277,265
Fans	28,838	28,306
Insulated wires and cables	302,029	91,528
Interior wiring supplies, etc. (including fixtures)	131,600	54,983
Lamps—		
Arc	1,290	2,754
Carbon-filament	7,593	6,012
Metal-filament	42,232	12,032
Meters and other measuring instruments	67,813	.....
Motors	209,014	413,214
Static transformers	23,217	49,464
Telegraph instruments (including wireless apparatus)	2,968	5,069
Telephones	57,090	202,979
All other	764,844	839,803
Total	$1,802,209	$2,040,720

Improving Railway Service.

Recommendations looking to increased safety of the Boston Elevated Railway Company's service are contained in a report made to the Public Service Commission of Massachusetts by William L. Puffer, electrical engineer. They include a new signal system for the East Boston tunnel, all-steel cars for subway use, more telephones in subways, with blue-light indicators, the covering of the third rail of the rapid-transit lines, the inclosure of high-tension cables in ducts, remote control of third-rail feeders, and of ventilating motors, with a separate source of electrical supply. Some of the suggestions contained in the report have been acted upon by the Elevated Company and others are under consideration.

Kilowatt Club Outing.

Brooklyn's representative electrical organization, the Kilowatt Club, held its third annual outing on July 17 at Donnelly's Grove, College Point. More than 300 members gathered at Jewell's Wharf and boarded the steamboat *Thomas Millard,* which landed them at the Point at 12:30 p. m. Here the electrical men formed behind the Governor's Band and marched in regimental style through the streets to the large dining hall at Donnelly's Grove, where a substantial breakfast was served.

Following breakfast a series of bowling contests were held. Then came the athletic activities. The fat man's race was won by J. Crowley; 100-yard dash by G. Teevan; shoe race by H. Lausbach; potato race by H. Mayer; two-legged race by J. Forker and W. Forker; sack race by H. Klein.

The judges of the contests were W. Hernandez, J. Crowley, M. Powers, G. Knight, M. Seelman, W. Hernandez, Jr.

There was a ball game between the married and single men, the married men winning by a score of 12 to 9.

After the game a "short circuit" was made to the dining hall, where dinner was served at 6 o'clock. The outing committee was composed of W. T. Fairbairn, chairman; B. F. Rush, H. W. Bishop and Robert Rodrigues.

White Way Inaugurated at Malone.

A new White Way was put in operation in Malone, N. Y., on the evening of July 17. A number of state officials were present and a parade through the village streets was staged in honor of the occasion. There was an informal dinner at the Hotel Flanagan and speeches were made from the balcony of the hotel after the parade. The system consists of 400-candlepower gas-filled incandescent lamps mounted upon ornamental posts, 42 in number. The posts were made by the Union Metal Manufacturing Company, Canton, O., and are 15 feet in height. Diffusing globes of Monax glassware were supplied by the Macbeth-Evans Glass Company. The posts are spaced 75 feet apart on both sides of the street and are staggered. There is a cutout in the base of each post, so that in case of trouble on one post the remaining lamps will not be interfered with, as a series system is used. Alternating current is supplied by the Malone Light & Power Company at a cost of $52 per lamp per year. The lamps burn all night.

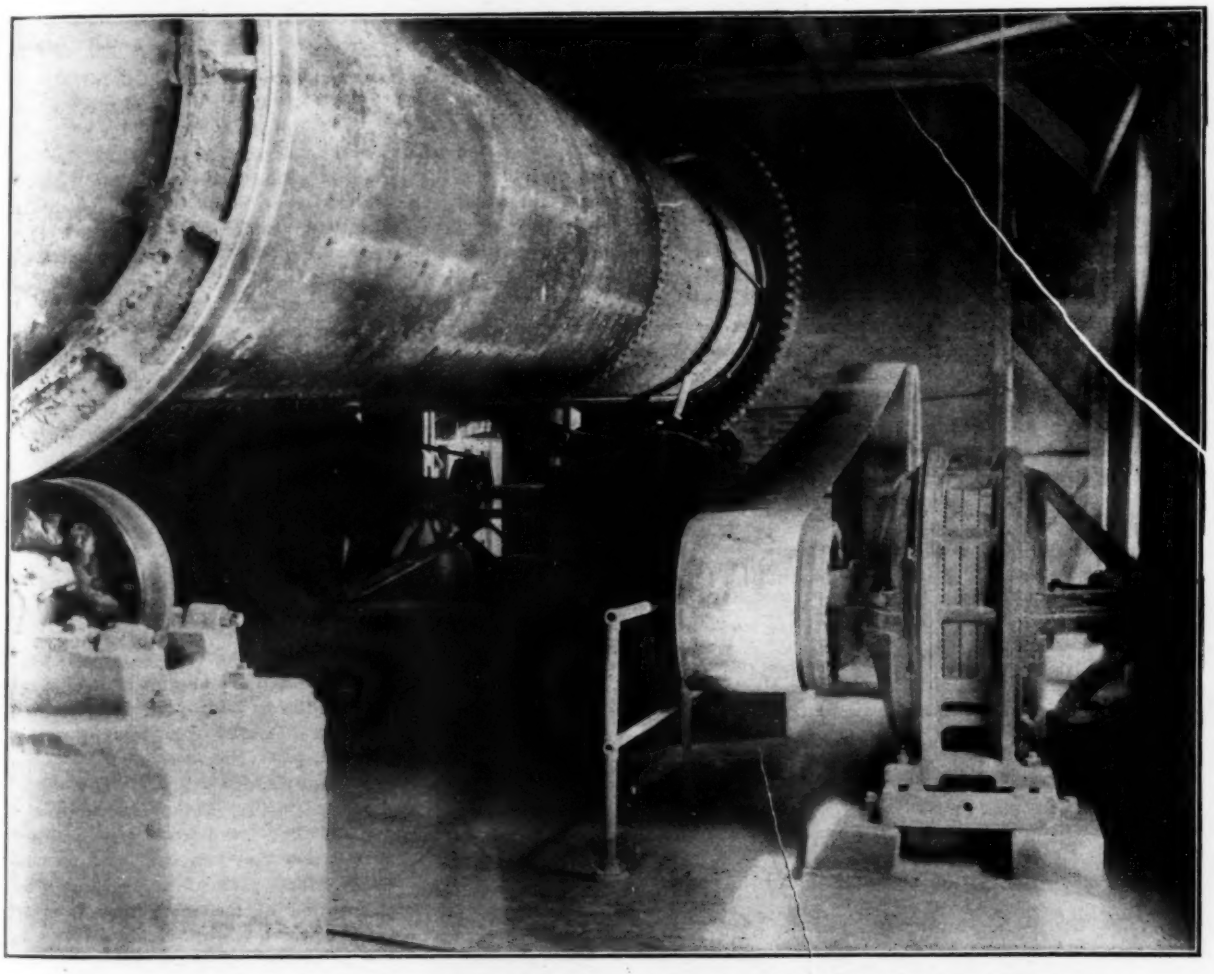
Electricity in Lime Manufacture.

By Arthur C. Hewitt.

This article is written by the engineer of an important lime plant, and treats the subject from the standpoint of the operator, pointing out the conditions to be met and the inherent advantages of electric motor drive. Data and specifications covering motor and control requirements are also given.

Electric power is the ideal power for use in the manufacture of lime and stone products. Among its advantages over other power sources are economy or efficiency, reliability, flexibility, and ease of cost distribution. It has the disadvantage of high first cost, danger from shock and danger from fire. However, these last two items are almost negligible quantities under present-day construction.

There may be special cases where steam or gas engines may have some little advantage over electric power on account of cheap fuel, etc., but where the lime plant extends over a considerable area, as most plants do, the electric drive is far superior to all other kinds of drive.



150-Horsepower Motor Driving a Large Hammer Mill Crusher, an Elevator and a Belt Conveyor.

In the first place, electric power can be transmitted about the plant much more cheaply than other power. Losses in long steam or compressed-air lines or shaft drives are usually much higher than the losses in electric transmission lines.

Electric motors weigh less for equal power outputs and require less attention than any other type. The modern alternating-current mill-type electric motors can be started in the morning and run all day with no more attention than to see that there is oil in the bearings. Electric motors will stand up under very adverse dust conditions better than will any other power unit. Who would think of allowing a steam engine to be half buried in lime or stone dust and still expect it to give satisfactory service? And yet this very thing is done every day in many lime and cement plants. Of course electric motors can not work as satisfactorily under these conditions as where enough forethought is given to place them in dustproof protecting rooms such as would be used to protect a steam, gas or oil engine.

Most lime plants are located some distance from cities so that as a rule they do not have access to first-class repair shops, and on account of the plant location and operating conditions, it is often difficult to get and keep first-class mechanics. This is certainly an argument against the use of gas, gasoline or steam engines, whereas modern electric motors require practically no attention.

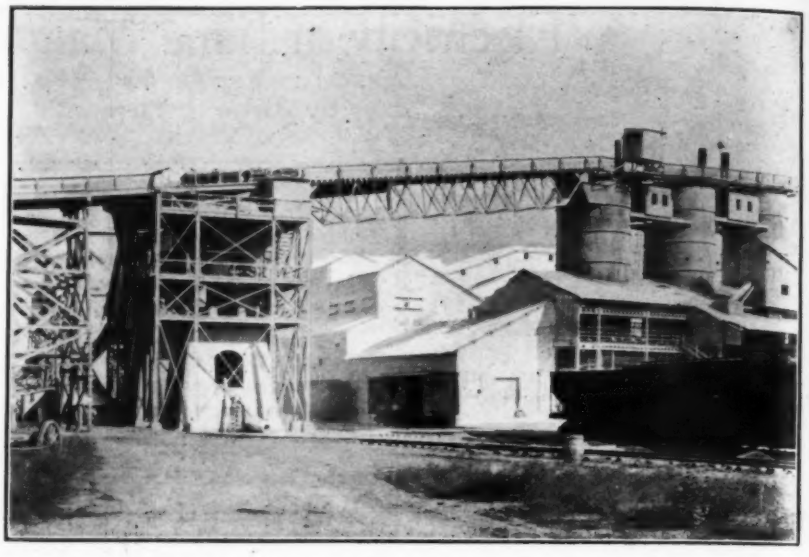
Electric motors can be expected to give the most reliable service. In a certain large lime plant where 35 motors were used, their reliability was shown to be 99.94 per cent perfect, figured on a readiness-to-serve basis. This figure represents the average for one entire year's

operation. The actual number of stops due to failures of the motors, distribution-system fuses, etc., around the plant was only 36, or an average of one failure per motor per year. These figures can be said to be a fairly representative example of the reliability of electric drives.

Electric drive can be made very flexible, and with flexibility there is no great loss of efficiency. For instance, motors can be selected to drive certain pieces of machinery and if after a trial it is found that a transfer of a large to a smaller unit is more desirable, the change can be accomplished very easily.

No other system of power supply is so admirably adapted to the distribution of power costs as is the electric drive. It is a very simple matter to so arrange the electric wiring that a meter can be placed on every department or on each individual machine and thus make it possible to keep accurate account of where all power is used. A very convenient way of arranging the meters is to have a central distributing switchboard with an indicating, as well as an integrating, meter for each department. The usual scheme is to use an integrating wattmeter for measuring the daily or monthly power consumption and an indicating ammeter to show the instantaneous rate of consumption. By watching the indicating meter any unusual condition such as a choked up elevator, conveyor or mill can be detected immediately and steps taken to remedy the trouble.

The disadvantages connected with the use of electricity about a lime plant can be disposed of very easily. The first cost may be a point which will be a deciding factor in the erection of a new plant. However, if the owner is far sighted enough to see the future benefits of electric drive, he will not let the item of first cost alone be the deciding factor.



View of Modern Plant for Manufacturing Lime and Stone Products. Crushed-Stone Plant at Left, Lime Plant at Right.

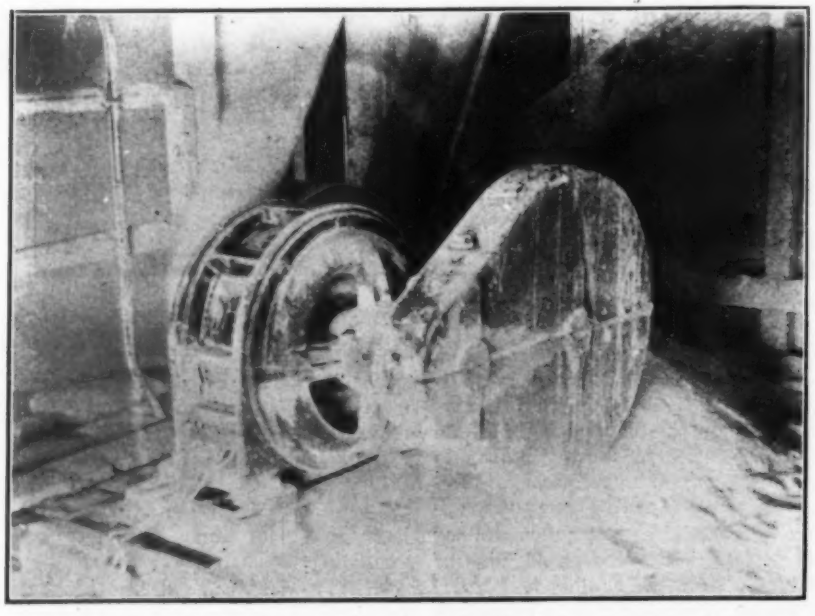
In some cases the first cost of the installation of electric motors will actually be cheaper than if some other kind of power was used. If a proposed lime plant were to be situated near an electric service supply line so that power could be purchased cheaply, then the first cost of electric drives in the lime plant would in some cases be considerably cheaper than the first cost of other drives.

In laying out a new plant it is very important that the engineer who determines what machinery will be purchased is fully aware of all the conditions to be met when the plant is in full operation. Many engineers undertake such work with little regard for the future operation and the result is that some other source of power than electricity would be a welcome relief to the troubles caused by a poor arrangement and type of equipment purchased. It must be understood that the average conditions in lime plants under which motors have to work are of the severest character imaginable.

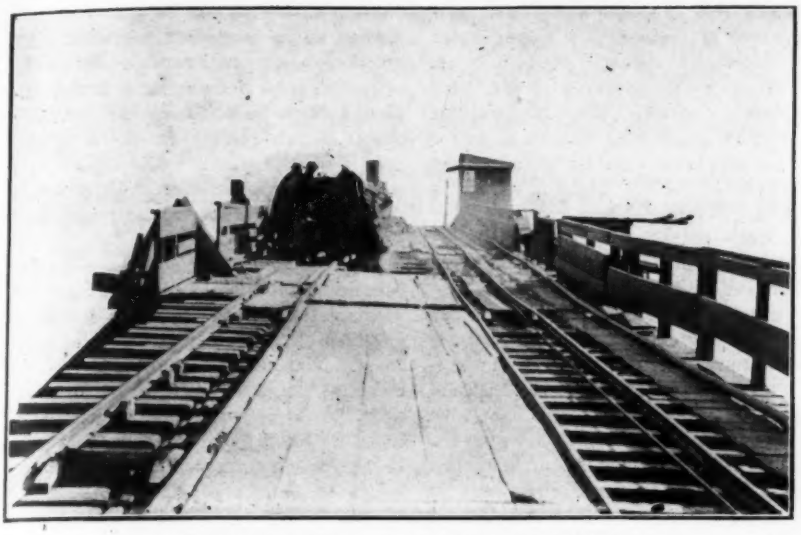
The mechanical equipment will not be discussed in this article. However, the various crushers, conveyors, elevators, mills, etc., should be so arranged as to give the greatest flexibility in operation. For instance, if when a certain crusher is running it is necessary to operate an elevator and a conveyor, the logical thing to do is to use one motor to drive the group. But if it is necessary or desirable to operate the elevator or conveyor when the crusher is not running, then it will be better to use individual motors for them.

Where high-speed belts are encountered in lime plants, they are usually a source of trouble both from slippage and breakage. A large high-speed belt has considerable potential energy and when it breaks it may cause considerable damage. For these reasons gear, chain, or direct-connected drives should be considered. Silent-chain drives have in many instances proved that they can withstand as much rough usage as gears or ordinary link chains and at the same time be much more efficient. Silent-chain drives offer the advantage of short drives between shaft centers and still give some of the elasticity of belt drives and can be used at high speed. A flexible or a semi-rigid coupling is desirable for many drives because they will be efficient and give less bearing trouble and cause less vibration.

It is very desirable where several motors, especially large ones, are to be used in or about a plant that all of the motors be of one make and operated at the same speed and that speed just as low as possible. To the designing engineer this may not be apparent, but to the operating man it is a fact that is very



Ten-Horsepower Back-Geared Motor Driving Two Elevators and a Screw Conveyor.



Dumping Stone Into a No. 9 Gyratory Crusher.

likely many times to be driven home.

If all of the motors used in a single lime plant are of the same type and built by the same manufacturer, it will mean that a smaller stock of repair parts will be required, for all manufacturers try to make as many parts interchangeable as possible. If all motors are the same speed and one breaks down, another can be used temporarily and no change need be made in pulley sizes. By using a slow-speed motor a more reliable one is obtained, one that will take care of momentary overloads, tight belts, etc. Tight belts are the cause of more motor troubles in lime and crushing plants than nearly all other troubles combined. This is due to excessive dust which causes belt slippage and when the belts begin to slip there are two remedies available to the mill man. One is to use belt-dope (which is generally used too frequently for the good of the belt) and the other is to tighten the belt. Of course it is no little job to cut a belt and take out a piece, and says the mill man, "I'll take out enough while I'm taking." Then look out for hot bearings!

The following specifications are not intended to be complete specifications for the various pieces of apparatus, but they are merely some notes that show what kind of equipment will give the best results in service such as is required in modern lime plants.

Motors which may be admirably suited for use in machine shops, textile mills and other factories may fail utterly to meet the severe requirements of cement or lime-plant operation. For this reason the suggestions herewith are given which may serve as a guide when purchasing new electrical equipment.

All motors in any one plant or system of plants should be of the same general design and preferably made by a single manufacturer. Distance from lime plant to nearest shipping point of motor manufacturer will affect the length of time required to get repairs and should be considered.

All motors should have absolutely dustproof bearings with ample bearing surfaces. Motors above 50 horsepower should be equipped with an outboard bearing on the pulley side.

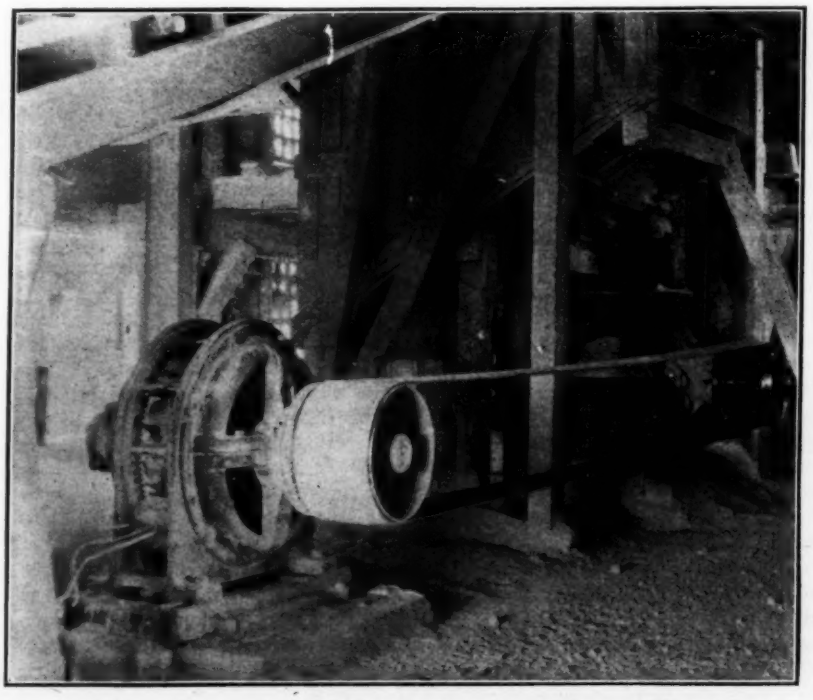
Every motor should be furnished with a sliding base or rails. This is necessary in order to keep the motor belt at the proper tension. In so far as it is possible all motors shall operate at the same speed. This will help greatly when a motor burns out and another is moved into its place temporarily. The speed of the motors should in no case be more than 900 revolutions per minute. Where it is necessary to use motors of different speeds the above table shows what maximum speeds are found to be good practice for lime-plant service with belted motors.

Motor Horsepower	Maximum speed for good results R.P.M.
1 or less	1800
1-5	1200
5-10	900
10-25	700
25-60	600
60-125	500
above 125	400

Motors should be furnished with cast-iron pulleys of the type known as the pneumatic pulley. This is a pulley similar to the ordinary pulley except that it has rows of slotted holes milled in the face. After trying wood, paper, composition, steel, and the pneumatic pulley this type has proved to be best suited for use in dusty places. Neither dust nor belt dressing will collect on the surface or clog up the slots which allow the dirt to work away from the belt surface. This type of pulley will cause much less belt trouble than any of the other types mentioned.

All motors in one plant should be equipped with screwed or bolted cable connectors. One size of terminal of a capacity large enough for the largest motor in the plant should be used on all motors. This will make for speed when changing motors. Terminals or connectors for this purpose should be soldered to the motor leads and also to the line wires or cables and should have a screwed or bolted joint which can be disconnected without unsoldering the connector.

Semi-inclosed or totally inclosed motors will give better service than open types as they will be more nearly dustproof. The rotor or armature in every motor is balanced before leaving the fac-



60-Horsepower Motor Driving a 36-by-24-Inch Jeffrey Hammer Mill.

tory but if they have to run where there is much dust, they soon get out of balance. Frequently this gets so bad without the dust being noticeable to the eye that a motor will vibrate very badly even when on a good, solid foundation. It is often necessary in such cases to use a long sharp-pointed screw driver to remove the dust from the rotating parts of the motor.

If alternating-current motors are used, they should be designed for about 5 to 7 per cent slip when carrying rated load. Where constant-speed motors are required, they should be of the squirrel-cage type for all sizes up to about 100 horsepower. Motors above 100 horsepower should have wound rotors with external resistance. Squirrel-cage rotors should have either welded or cast-on end rings. Rotors with bolted, screwed, soldered and riveted joints between rotor bars and end rings have proven very unsatisfactory where severe service conditions and rough handling are to be met with. The welded or cast end-ring construction is as near perfection as will probably ever be obtained.

Where large motors have to be started and stopped frequently, where heavy starting torque is required or where variable speed is required the wound rotor with external resistance must be used. Hoists and large crushers should have this type of motor. Alternating-current motors are not very satisfactory for variable-speed work at the present time on account of the elaborate control equipment they require. They are used, however, very extensively in cement mills for driving rotary kilns. The time is not far distant when alternating-current motors will be manufactured that are on par with direct-current motors where variable speeds are required.

The rules set down by the National Board of Fire Underwriters should be adhered to strictly in wiring lime plants. Exterior wiring should be of the open type, but heavier than ordinarily used in line construction. If the mill buildings are of wood then a similar type of line construction should be used. However, if first-class steel or concrete buildings are put up, then the electrical equipment should correspond; the outside wiring should be put on steel or concrete poles, fitted with steel cross-arms and steel pins. Porcelain strain insulators should be used where insulated guys are needed. The interior wiring should be placed in galvanized iron conduit throughout. All junction boxes and conduit should be extra large for future extensions or additions. It is well to use nothing smaller than 0.75-inch conduit for motor wiring even though 0.5 inch would answer. It will pay in the long run. All pipe joints should be screwed; no clamp couplings should be used.

No switch smaller than 100-ampere capacity should be used on account of mechanical strength. Switches should be mounted on separate slate bases from the fuses. This will allow of unit replacements as the parts get worn out or damaged. Separate fuse blocks for each fuse will be found advantageous especially in alternating-current wiring. Alternating-current motors should be so connected that heavy fuses can carry the current for starting and fuses of proper rating can protect the apparatus when running.

Fuses are to be recommended as being cheaper in first cost, a little more reliable and need less attention than overload circuit-breakers, etc. However, there are places where an automatic circuit-breaker may be used to advantage.

Commercial Practice
Management, Rates, New Business

BILLING AND COLLECTING SYSTEMS OF SMALL COMPANIES.

Practices in Towns Under 50,000 Population Show Wide Variance.

In response to numerous inquiries as to the practices of the small central stations in reading meters, sending out monthly bills and collecting accounts, a canvass was made among numerous companies serving communities of less than 50,000 population, the returns indicating widely varying methods in vogue.

Opinion seems to be equally divided as to the advisability of mailing or delivering the monthly bills, although, save in a few instances, no local conditions seem to enter into the question. Of the companies reporting, which mail bills, opinion is also equally divided as to using one-cent postage, or postal cards and two-cent postage. Those companies sending bills out under two-cent postage are unanimous in their belief that the extra expense involved is justified because of the opportunity to include advertising matter with bills when sent under two-cent postage and also because of the publicity attached to unsealed bills.

A majority of the companies included in the canvass either use space on the bill heads for advertising or inclose advertising literature in the same envelope. All feel that this expense is well worth while, although in no case are figures available as to results, or have efforts been made through coupons or otherwise to check returns. Where appliances are not sold by central stations the available space is frequently used for various announcements relative to some phase of the company's service.

In connection with meter reading there seems to be a continually growing tendency to adopt the continuous-reading system whereby a community is divided into districts, each with its separate discount period, and reading of meters is continuous throughout the month. In some cases where this plan is followed meters are read in the forenoon and bills delivered by the same employee in the afternoon, a day intervening between the reading of meters and delivery of bills in each district. Occasionally, also, companies have found it convenient to have bills collected by the carrier at the time of delivery.

The detailed practices of a number of companies operating in communities of less than 50,000 population will be found in the subjoined paragraphs.

Eastern Wisconsin Railway & Light Company, Fond du Lac, Wis.

The city is divided into districts, each of which has its separate 10-day discount period. Only one meter reader is employed who devotes his entire time to this work, and reads both gas and electric meters. There are a total of 6,120 meters in the city. The reader works 25 days per month, nine hours per day and has read a maximum of 300 meters per day in populous districts. The bills are delivered by a collector who collects the money on the spot, or who leaves bill if the customer is out. The collector also does missionary work, adjusting minor complaints, suggesting new uses of energy, etc. The districts were arranged so that the meters in the business district are read the last of the month so that they can be paid on the first. In only two cases outside of this district were requests made to have bills rendered on the first of the month and both of these customers were so located that their requests could be granted without inconvenience.

Rockford Electric Company, Rockford, Ill.

We deliver the major portion of the bills in sealed outlook envelopes. The portion mailed are sent under two-cent postage. Meter readers perform the work of delivering bills that are not mailed. We use the space on the back of the bills for advertising purposes and find that results are very satisfactory, in fact much better than newspaper advertising. We bill approximately 6,000 consumers.

We have had under consideration a number of times the question of reducing our mailing expenses by sending our bills on a postcard. However, we have so far hesitated to take this step on account of the publicity attached to it, and also that we consider that the advertising which is on our bills is of sufficient value to make up for the excess cost.

It is but small additional work for the meter readers to deliver bills on account of their being familiar with the routes and knowing just where to go because they have read the meter at each place. This avoids much confusion which would necessarily result if the work was done by the clerical force.

I believe that our customers are much better satisfied in receiving their monthly bills in a sealed envelope than they would be if they were delivered without inclosure, or on a postcard through the mail.

Our cost of delivering is less than what it would be at two-cent postage, and is a little more than what we could do it for through one-cent postcards.

June, 1915 N. B.—Cheap Light With Inferior Lamps is Impossible.

TO THE SANDUSKY GAS & ELECTRIC COMPANY, DR.

PRESENT THIS BILL AT THE OFFICE

OFFICE HOURS: 7:30 A. M. TO 5:30 P. M. SATURDAY 8:00 P. M.

JUNE 15 to SEPT. 15 Close 12 M. on SATURDAY. On 10th of Every Month we Close at 8:30 P. M.

AMOUNT DELINQUENT

DATE READ

STATE OF METER _____ K. W. H.

PREVIOUS STATE _____ K W H.

CONSUMED _____ K W H

If all bills are paid at the office of the company on or before the 10th of the month the current will not be turned off. When current is turned off a charge of $1.00 will be made and collected before current is turned on again.

☞ Bring this Card so your account will receive proper credit.

N. B.—WE SELL BEST MAZDA LAMPS
If Your Service is Bad, Tell Us. We Can Help You.

ELECTRIC
June, 1915
Folio.....
Line.....

Postal-Card Bill Form of Sandusky Gas & Electric Company.

Wisconsin Public Service Company, Green Bay, Wis.

Practically all of our bills are delivered to customers by special men who also do the meter reading. There are a few mailed by special request. We have one or two outlying towns in which the bills are mailed under one-cent postage. These bills are inclosed in envelopes, but as there is no free delivery the postage is one cent. The delivering of bills is ordinarily performed by our regular meter readers who devote their entire time to meter reading and delivering of bills. The cost of meter reading averages about 1.5 cents per customer, the cost of billing about 1.6 cents and the cost of delivering averages 1.1 cents. Space on bills is used for advertising, but we can not ascribe any results we may obtain specifically to this class of advertising. We are doing advertising daily in newspapers, billboards, personal solicitation, motion-picture shows and some other forms and it is difficult to tell just where the new business derived is obtained. It is quite possible that the bulk of it is derived we feel from the constant reiteration of our story. We bill something over 6,000 customers.

Southern Illinois Light & Power Company, Hillsboro, Ill.

All of our bills are mailed to our customers. In towns where there is free delivery, two-cent stamps are used, and one-cent stamps in smaller towns. We have no advertising on our bills, but generally put advertising matter in the envelope. We have gotten some results from this method by following it up each month. We have something over 6,000 customers. We believe that we can more easily reach all our customers through postal service than by being delivered by carrier.

Minnesota Gas & Electric Company, Albert Lea, Minn.

We operate a combined gas and electric service. The gas and electric meters are read by the same man at the same time, and the same holds good on our bills. The following figures, which are totals for both departments, cover about 2,500 bills monthly, divided as follows: 1,500 electric and 1,000 gas, 75 per cent of the latter being readings and collections from prepayment gas meters. These 2,500 bills are delivered to about 1,600 different addresses. About 200 of these 1,600 bills are mailed under two-cent postage, the balance are delivered by one of the office men. The cost of billing, including reading meters, making out the bills, entering the same in customers' ledger, is approximately two cents per bill, or a trifle over three cents per customer. We do not use space on the bills for advertising, but do use occasionally inclosures with the bills, advertising different appliances. We have no direct

Don't Swelter this Summer

The easiest, cheapest and best way to keep cool is the

ELECTRIC WAY

USE

ELECTRIC LIGHT — ELECTRIC FANS
ELECTRIC IRONS — ELECTRIC WASHING MACHINES
ELECTRIC TOASTERS — ELECTRIC PERCOLATORS

If your house is not wired, call 19 today and have it done in time to make this your coolest Summer yet.

To THE MIDDLETOWN GAS AND ELECTRIC CO., Dr.

Office Hours | 8 A. M. to 5 P. M. Saturday until 9 P. M. | *333 South Main St., Middletown, Ohio*

Gas and Electricity for Month of *June 1915*

For Natural Gas Consumed to Date of Reading — Present Reading of Meter 000
Previous Reading of Meter 000
Cubic Feet of Gas Consumed ..... 000 @ 40c per M
If Paid at Our Office on or before July 10th, 1915, Less Discount of 10c per M

For Electric Current Consumed to Date of Reading — Present Reading of Meter .....
Previous Reading of Meter .....
K. W. Hours Consumed ..... @ ..... Cts.
If Paid at Our Office on or before July 10th, 1915 Less Discount of 10 %

Flat Rate .....
Extras billed during month ending the 20th inst. .....
Extras shown on previous statements, now delinquent .....
TOTAL

Checks mailed in payment of Gas and Electric Bills must bear Post Mark of not later than July 10, 1915, to entitle consumer to discount.
If not paid by the 20th the supply will be shut off without further notice.
ALWAYS PRESENT THIS CARD WITH PAYMENT
FAILURE TO RECEIVE A BILL DOES NOT ENTITLE CONSUMER TO DISCOUNT AFTER THE DISCOUNT PERIOD

C

June 1915 — NET TOTAL
GAS
ELECTRICITY
FLAT RATE
EXTRAS
DELINQUENCY
TOTAL

Combination Bill of Middletown Gas and Electric Company.

check on the results of this kind of advertising. We find that the delivering of the bills by man is less expensive and just as good as delivery by mail, except in outlying districts where customers are comparatively few. We do not have a continuous system of reading meters, but read our meters once a month, starting about the twentieth of the month, and find that we can get through and have our bills delivered by the first of the month, without upsetting our other work to any extent.

The Sandusky Gas & Electric Company, Sandusky, Ohio.

We use postal cards for our billing entirely. Using same in connection with Matthews receipting machine, we find this a very satisfactory method of billing. Prior to our using postals, we had a regular bill and delivered it by messenger. We found that many people complained of not receiving their bills, and in this way this question is now up to the Post Office department. The regular one-cent regulation postal card is used. We bill about 6,000 customers a month. We have abandoned the card ledger for a permanent bound ledger, when this system was adopted, and find it more satisfactory. Our clerks, in addition to the general office routine, handle approximately 2,000 accounts each.

Eastern Michigan Edison Company, Ann Arbor, Mich.

We deliver our bills by messenger, using part of our office force in doing so. We have also a select mailing list for a limited number of our customers who prefer to receive their bills through the mail. We use our office men in order to give them a chance to get out of doors one or two days a month which they enjoy. Our cost of billing customers runs from one-half cent to three-fourths cent, depending somewhat on the season of the year. We use the back of our bills for advertising appliances, but are unable to state definitely, the results. We are billing, at the present time, approximately, 10,000 customers. We have about 300 bills on our mailing list which are covered by two-cent postage.

Sheboygan Railway & Electric Company, Sheboygan, Wis.

We mail our regular lighting bills to customers on a postal card with one-cent postage. If material bills accompany the bill for lighting or power, the whole consignment is put into an outlook envelope and mailed under two-cent postage.

The printed postal card permits a very small space for advertising purposes, but at the present time, we are not able to state just what the results have been from this method of advertising, since it has not been very extensive. The number of customers we bill is something over 3,000 each month. In connection with advertising, we have, on several occasions, had special notices to bring before our customers, and this has been done by handling the notice in the same manner that we handle the material bills; namely, inclosing all in an outlook envelope and mailing at the two-cent rate. This gives an additional cost for postage of $30, plus the cost of the envelopes, and we believe it is a wholly effective method of placing special notices before customers, since the customers are very careful to secure their light bills, and naturally examine whatever else may be in the envelope.

Wisconsin-Minnesota Light & Power Company, La Crosse, Wis.

We are at the present time reading our meters on the continuous meter-reading basis. We have divided up the city of La Crosse into 23 routes. We have two readers who read each forenoon between them, one route. In the afternoon they deliver bills for previous readings; that is on the afternoon of the third day they deliver the first day's readings. The only bills that we mail are the pick ups and notes. It is costing us at the present time to read and deliver our bills $0.0118. It is costing us to bill to customer $0.0142, which makes a total cost per customer of $0.026 to read, bill and deliver. Of course this does not include the overhead expense, other than the cost. We have discontinued using the space on back of bills for advertising purposes, and are at the present time putting on the backs of our bills a copy of Rules and Regulations governing gas and electric services. The returns from this class of advertising are so small in comparison with the cost, that of having the bills printed in 25,000 lots instead of in 5,000 lots. We are billing approximately 5,500 customers, which covers about 9,000 meters, gas and electric.

Kentucky Traction & Terminal Company, Lexington, Ky.

Up to the first of July we mailed our bills to customers, two cents postage involved, including advertising matter. Since the first of the month we have been delivering these by a clerk who also collects current and delinquent bills at time of delivery. We have practically 1,800 customers and the bill cost amounted to about $40 per month, excluding clerk's time. We are now distrbuting bill by a $40 clerk, or at the same cost and with very satisfactory result.

Citizens Light, Heat & Power Company, Canby, Minn.

The company bills approximately 662 customers each month, the bills being mailed under one-cent postage. The cost is analyzed as follows: Printing $2.40; bookkeeper's time, $15.90; reading meters, $8.75; stamps, $5.30; envelopes, $1.75; miscellaneous expenses in connection with reading meters, $2.75; a total of $36.85, or an average cost per customer of $0.055. The discrepancy in the number of customers and number of bills mailed is accounted for by the fact that in several instances more than one bill is sent to a single address.

Louisville Earnings Increase.

Since March the Louisville Gas & Electric Company, Louisville, Ky., has been showing good gains in gross earnings and greater gains in net, thus reflecting the results of vigorous sales efforts and efficient operating methods. For the first six months of the year the gross earnings increased $83,060, or 8 per cent, as compared with the first half of 1914, while the net earnings advanced $88,914, or 17 per cent.

Value of Advertising.

Surprising results followed the insertion in the daily newspapers of an advertisement bearing substantially the following text, by H. E. Young, sales manager of the Minneapolis General Electric Company: "To Our Customers Good for Tomorrow Only. If you have a friend or acquaintance who is not using electric light just give us his name—and if the house has been built at least a year—and is on our lines—and we have not already received the name—we will present you with an Electric Toaster, as shown, absolutely FREE."

More than 300 people telephoned and brought lists of names of wiring prospects, totaling approximately 1,000 on Wednesday, July 7, the day designated, and many additional prospects were turned in the following day by people who wanted to make sure of getting a toaster. Although the Minneapolis General Electric Company has seven trunk telephone lines but two of them are connected with the Sales Department, and these were kept busy continuously during the entire day by people who wished to take advantage of the offer. Many, finding the telephones unavailable, due to this unusual pressure, came down town and handed their lists in personally, some as many as 20 names of friends and acquaintances. Ninety per cent of those responding were women, the majority being obviously members of families with comfortable incomes. During the remainder of the week about 200 additional inquiries were made by people desiring to know if there was not some way in which they could take advantage of the proposition. These applications were refused, and the inquirers referred to the Company's regular summer premium offer, which gives various electrical household appliances free to customers who get wiring prospects.

The idea of making the free-toaster offer in return for live prospects suggested itself to Mr. Young owing to the fact that the company was carrying an unusually large stock of low-priced toasters left over from the winter holidays' campaign. His plan cleaned up every toaster which the company had on hand, has given the company a house-wiring prospect list of not less than 1,000 new names, and has put the Sales Department in touch with 300 or more people who have shown a willingness to co-operate with the company in a very friendly way.

Electric Luncheon Held by Great Western Sales Force.

An electric luncheon was held recently by the sales force of the Great Western Power Company, at the Hotel Washington, San Francisco, Cal. There were 65 present, including Mortimer Fleishhacker and the heads of various departments. The entire menu was prepared on two electric ranges, the current consumption amounting to 14 kilowatt-hours. At three cents per kilowatt-hour for energy the cost of preparing the luncheon, per person, was less than 6.5 mills.

An interesting feature of the luncheon was the menu, prepared on the company's regular order blanks in the form of a purchase order. Following the luncheon remarks were made by F. C. Czarnecki, secretary to the president, S. E. Gamble, Petaluma, F. H. Woodward, Oakland, C. E. Maynard, A. Mabico, and E. A. Wilcox, of San Francisco. W. Briggs acted as toastmaster.

One feature proposed by Mr. Briggs and unanimously adopted was that a banner be awarded to the district making the best showing during the next three months in the development of the electric cooking business.

Portland, Me., has "Electricity Week."

The week of July 12-17 was observed as "Electricity Week" at Portland, Me. The local newspapers specialized in a campaign for electrical advertisements, among the large space takers being the Cumberland County Power and Light Company; Cressey & Allen, advertising the electric Victrola; Charles M. Hay Paint Company's electrical department; Lowell & Sears, contractors; C. Coughlin and L. W. Cleveland, dealers in domestic appliances, and the agents for the Eveready lighting devices.

The *Portland Argus* offered two prizes for the best and second best essays of not over 250 words on the convenience and usefulness of electrical domestic appliances advertised in that paper. The prizes were an electric fan and a Hotpoint flatiron.

Porch Lights in Campaign at Springfield, Mass.

The United Electric Light Company, of Springfield, Mass., is advertising the pleasure to be derived from electric porch lights during the long summer evenings, when the house is too "stuffy" for comfort. It points out that the lamps are readily installed and will make the porch as well lighted as any room in the house, enabling the family to read, sew, play games, etc.

Such porch lights may be plain and simple or attractively ornamental.

SUCCESSFUL COMMERCIAL MANAGERS.

A. K. Young.

There is perhaps no other central-station company comparable in size that can boast of the sales record enjoyed by the Toledo Railways & Light Company. Especially during the past two years has the business made remarkable advances, during this time several campaigns being held which have established new precedents in sales activities. The records are particularly interesting when it is learned that in all these campaigns list prices wer absolutely maintained. It is a theory of A. K. Young, new-business manager of the Toledo company, that real sales ability is the only requisite necessary to sell electrical appliances, providing, of course, the article is meritorious and the

A. K. Young.

campaign timely. He has so convinced his men of this theory that when an appliance, sign or other device is being featured the salesmen go into the field and get the business. As a tribute to Mr. Young's executive ability and personality it may be stated that during the course of these campaigns, although the regular salesmen do the work, the other business of the company is not allowed to languish.

Mr. Young started with the Doherty Company 10 years ago in Cincinnati with the Union Gas & Electric Company, and was later transferred from there to the Montgomery Light & Water Power Company, Montgomery, Ala. From there he was sent to Bristol, Va., to the Bristol Gas & Electric Company; from there to the Brush Electric Company, Galveston, Tex., and from the last named property to the Toledo Railways & Light Company.

It is significant to note that statistics show Montgomery, Bristol, Galveston and Toledo are among the best lighted cities in the world, for their size. This is a hobby with Mr. Young.

The results in Toledo during the past year have really been remarkable. The new-business department, under the direction of Mr. Young, sold 517 electric signs during 1914 on a flat-rate contract, burning from dusk to midnight each night in the year. January of this year, in order to prove that the saturation point had not been reached, Mr. Young inaugurated a "sign a day" campaign, and sold during the month 32 signs.

The company endeavors in all instances to sell electrical displays that are individual and distinctive, restriction being made to one sign of its kind throughout, with no duplicating in any instance.

In the last few months the company has had several small appliance campaigns. For instance, last July 2,508 appliances were sold in 10 days. In December an additional 10-day campaign was inaugurated with the result that 1,704 appliances were sold. Not satisfied with this record Mr. Young planned a 14-day campaign later and 1,100 additional appliances were disposed of.

One of the most successful and noteworthy special campaigns carried out by the sales department of the Toledo company under the leadership of Mr. Young was that featuring a standard $50 vacuum cleaner. During March of this year 300 of these appliances were sold, although newspaper advertising on a small scale and street-car posters were the only methods of advertising adopted. It is interesting to note that there had already been 1,000 vacuum cleaners sold in Toledo as a result of two previous campaigns during the past two years.

Also, during the same month of the vacuum-cleaner sale, an effort was made to increase the use of porch lights with the result that orders were taken for 63 installations of this character.

The central-station industry is familiar with the contract recently closed by the Toledo company covering an installation of industrial electric heating aggregating 6,200 horsepower, representing an annual revenue to the company of $150,000. This was the first move of the company in an effort to build up an industrial heating load and Mr. Young states that he estimates 100,000 horsepower of this business for 1915.

During the past two months attention has been given the extension of electric cooking. Already 12 ranges have been sold with bright prospects for the future in this field.

To aid navigation a lightship has been established in the harbor of Buffalo, N. Y.; it has a flashing white electric incandescent light. At the Schuylkill River Range, Pa., the navigation light has been changed from acetylene to electric incandescent.

Electrical Construction

BUSINESS HINTS FOR CONTRACTOR AND DEALER.

By G. D. Crain, Jr.

Emphasizing the Mistakes.

"See those items in red ink?" inquired a contractor, indicating an estimate sheet on a big wiring job which he had recently completed. "Those are items which our estimator failed to include in the original figures on the job, and the cost of which, accordingly, comes out of our profits on that job.

"Putting them down in red ink calls attention in a very emphatic way to these errors of omission, which are just as serious as those of commission. And, believe me, after every job is checked over, and the missing items noted, the estimator knows whether or not he has been hitting the bull's eye.

"This, in my opinion, is the most important thing about the contracting business: finding out the mistakes made on every job. Our system of issuing material, requiring itemized labor reports, etc., shows us exactly the cost of every job. To this we add 20 per cent for overhead. Then the cost is compared with the contract price, and the percentage of profit or loss figured. In this way I can go back over the work for the week, month or year, and see to the last cent how much I have been making; how the estimates have been running, and whether the material bill has been kept within the limits originally set.

"Furthermore, any contractor in this town who wants to see how we figure a job is welcome to come into this office and look over these cost sheets. We are glad to compare notes as to methods of handling the proposition, believing that it is for the good of everybody to find out the best way of doing things."

Making Telephone Appointments.

The day of the "bell-ringer" and the "canvasser" who went from door to door is about over. The man who has to ask for "the lady of the house," and take a chance on having the door slammed in his face, is handicapped right to begin with. In some cases this may be necessary; but in others, where the system is still being used, it could easily be replaced with a better one.

For instance, an electrical concern decided to make a special play on a vacuum cleaner which was popularly priced. It was light, well made and had a number of good talking points, while the price was low enough to put it in the reach of most well-to-do families. The company might have put its solicitor out in the better-class residence districts, given him general instructions, and let him go to it; but the plan actually used had that beaten in a good many ways.

This store believes in the use of the telephone for sales work, and uses it whenever possible. In this case the phone was used for making appointments. An intelligent young woman in the office was put at the telephone, and called up the people living in a certain district which was to be worked. This was easy, reference being made first to the city directory, and then to the telephone directory. The mistress of the house was called for by name, and the girl told her story about like this:

"Mrs. Smith, this is the Blank Electrical Company. We are showing some of our customers a very attractive vacuum cleaner which we have recently taken hold of, and would like very much to send one of our demonstrators out to your house tomorrow. Will that be all right? Ten o'clock in the morning? Very well; and thank you!"

After that, the appointments were arranged according to time and location, and the salesman stepped up to the door of every home assured of an entree and a hearing for his proposition. Incidentally, this plan sold a lot of vacuum cleaners.

Display's the Thing.

The dealer who wants to get from the storekeeper into the merchant class must know how to display his goods. That is fundamental. The same stock in one store will look unattractive and featureless, and in another will stick out like the proverbial sore thumb. It's all a matter of display.

Nothing succeeds like success; people like to patronize the successful establishment. And the thing which gives the appearance of success, like a well groomed appearance with an individual, is to have plenty of the stock in evidence. The people who see it are bound to realize that the dealer has the courage of his convictions, and believes in his proposition to the extent of putting his own money into it. And, besides, the store with the stock is also the store with the service.

One of the less prominent electrical concerns in a certain Middle Western city has attracted a lot of attention to itself this season in connection with fan business, simply by making the best possible use of its stock, and by displaying it so as to give the impression of having a large selection. It has built up display shelves of old packing boxes, covered with dark cheese-cloth, and the fans rest on these shelves, one tier above another. There are several sections of this kind in the store, arranged according to the kind of fans—direct current, alternating current and second-hand—and anyone coming into or passing by the store gets the impression right away that this must be "fan headquarters."

Of course, this dealer doesn't stop merely with display. He goes ahead and advertises for business, and keeps circulars in the mails, besides making direct solicitations whenever he can. But the basis of the whole thing is that he shows, by the way he displays the goods, that he has plenty of fans, of all kinds, and is in a position to meet any requirement that may be made of him.

The Value of Checking Up.

Those contractors who imagine that it is a waste of time to have every job checked up, and material and labor figures carefully tabulated, may be interested in an incident which happened recently with a big concern in the Ohio Valley.

It had handled a wiring job for a residence some distance from the community where it is located. It was on an electric line eight or ten miles from the city. In going over the figures for the job, after the work had been completed, it was found that through a mistake a good deal more wire than necessary had been requisitioned, but that none of the material had come back.

Attention was called to this by the office, and some inquiries made. All of this took some time, and it was several

weeks after the work had been finished when the wire was located. It was at the freight station of the interurban railway, and would probably never have been turned in, in the absence of shipping instructions, if the contractor himself had not been on the job and made inquiry.

The wire was valued at $20, and having this little checking system added that much to the net profits of the business, a fact which seems to demonstrate the value of the idea.

Direct Solicitation of Business.

The concern which advertises, has a good location for its store, and in other ways puts itself in the retail trade channel of its community, is sure to get a good deal of business, and to makes sales over the counter in comfortable volume.

But the electrical concern should not consider itself like the dry goods store, the hardware store or the clothing establishment, all of which deal in staples, and as a general rule wait for customers to come to them. It can afford, on the other hand, to go out and seek business, and because of the educational work which often must be done, it really can't afford not to.

And there is a lot of business which is what might be called potential. That is, the necessity which makes logical the purchase of the goods exists, but the buying impulse must be furnished by actual solicitation. Take, for instance, the electric-fan business. Motion-picture theaters, hotels and other places where the public comes in numbers need fans, and of course a great many have them. But the dealer who wanted to move a lot of fans could profitably put a man on the street, calling on hotel and theater proprietors, analyzing their fan requirements, and closing up the business. This will develop a lot of trade that otherwise would remain latent.

A Standing Advertisement.

The work that a contractor does is a permanent advertisement of his concern. If it is good work, it is a good advertisement; but, to just the same extent, it is a bad one if the work is not all that it should be.

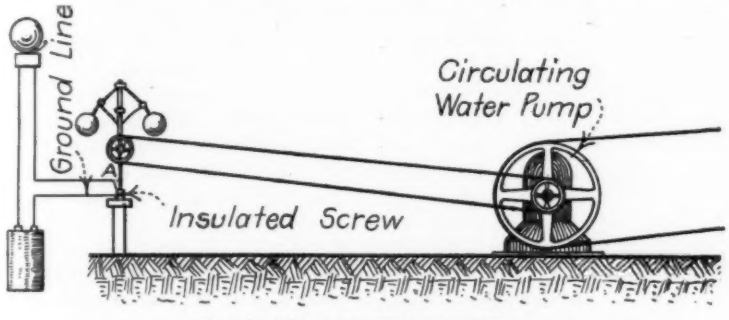
A little point like the location of electric light switches may influence future business. A lot of contractors who put the switches, in the absence of specific instructions from the architect or owner, wherever it is easiest for them, and without regard to their convenience, fail to remember this.

The writer was recently in a residence where the switches were placed at the most inconvenient points possible. They were behind doors, or on the opposite wall from the entrance, etc., so that turning on the light, instead of being the simplest thing in the world, became a matter of some difficulty under certain circumstances.

It is not always easy to put the switch just where it ought to be, but in the interest of a good standing advertisement for the contractor who is doing the work, why not try to place it there?

Electrical Signal for Water Pump.

In a gas engine and vacuum pump which runs day and night the circulating water is a very vital part. Instead, however, of keeping an engineer on duty all night an arrangement was fitted up so that an alarm would be given in case anything went wrong and the water pump stopped operation.



Electric Alarm Connected to Pump.

The accompanying illustration shows the connection. A ball governor, making 150 revolutions per minute, was connected by belt to the circulating pump. The electric circuit from the battery and bell had one wire grounded to the governor base and the other wire connected to an insulated contact, A, so that when the governor was operating the circuit was open, but if the governor dropped down the circuit would be closed and the bell would be rung.

E. W. Edwards.

New Wiring Inspection Ordinance for Jersey City.

The Board of City Commissioners, Jersey City, N. J., has adopted a new ordinance governing the inspection of electric wiring in buildings, providing for the establishment of a new bureau of electrical inspections, to be under the supervision of Building Inspector John Saul; a chief inspector will be appointed by the Board. The bureau will be self-sustaining, being supported by the fees charged for electric inspection and making the city the beneficiary. Under the former plan, the Board of Fire Underwriters has been handling the inspection work, no inspections being made by the municipality.

Among the Contractors.

Fred G. Dustin, of the Standard Electric Company, Minneapolis, Minn., reports two new jobs just started: the N. W. Knitting Company, power work, $1,650, and residence for A. L. Searle, $1,500. The N. W. Knitting Company work consists of wiring for 18 five-horsepower 220-volt, three-phase motors, with 300,000-circular-mil cable from the switchboard to a new panel on the third floor. Open galvanized conduit is used, mounted on the concrete ceiling, and Detroit motor starters are employed. The A. L. Searle work will be a strictly high-grade conduit job in a fireproof building, and will include wiring for lights, public and private telephones, vacuum cleaners, etc., service being brought in underground.

A. P. Mehren, of Downer's Grove, Ill., has secured the contract for wiring the new library building in that town, a conduit job. He also has the contract for rewiring the courthouse and jail at Wheaton, Ill.

The contract for wiring and placing of electrical fixtures in the new $25,000 school at Stonehoro, Pa., was recently granted to the G. A. Webster Company, of Youngstown, O.

Kohler Brothers, contracting electrical engineers, have moved their Chicago office to 111 and 113 North Jefferson Street, where their shops have been located for the past year. This location is near the heart of the electrical center of Chicago, which has shown a gradual trend to the West Side. The Chicago office will continue under the managmeent of Charles R. Kreider.

P. W. Lowry, Racine, Wis., has filed a voluntary petition in bankruptcy. Milton Knoblock, referee in bankruptcy; set July 27, 10:00 a. m., as the time for a hearing. No report of the proceedings is available at time of going to press.

Robert Hughett, who has been connected with the Citizens Lighting Company, La Salle, Ill., is preparing to open an electrical shop for repairing electrical work and dealing in electrical merchandise.

Public Service Commissions

Conducted by William J. Norton

CALIFORNIA.

The Tulare County Power Company was authorized to sell its electrical distribution system and plant in Tulare County to the Mt. Whitney Power and Electric Company for the sum of $550,000.

MASSACHUSETTS.

Adams Gas Light Company appealed to the Board from an order of the selectmen of the town of Adams, which granted the Connecticut River Transmission Company authority to erect and maintain wires for the transmission of electricity across a certain public way in the town of Adams. The Transmission Company furnishes service at present only to the street railway company and two manufacturing concerns. The sole purpose of its lines is the supply of electricity "in bulk." The purpose of the appeal is to have established the limitations under which the Transmission Company shall engage in the distribution of electricity in the territory which was already supplied by the Adams Company. This appeal is brought under section 157 of Chapter 121 of the Revised Laws of 1914. Under the Massachusetts laws there is no "certificate of convenience and necessity" provision, which is in a number of the public service commission laws of other states. In a city or town in which a company is engaged in the manufacture or sale of electricity, no other person, firm or corporation is allowed to erect and maintain in the streets any wires for the transmission of electricity without the consent of the local authorities, and provision is made for appeal from the decision of the local authorities to the Board and its decision is final. (Section 156-160, inclusive, Chapter 742, Acts of 1914.) In such cases on appeal the Board has the power to determine to what extent, if at all, competition should be permitted.

It was suggested on behalf of both companies that an arrangement similar to that established in connection with the entry of the Transmission Company into Clinton would be satisfactory. There being no opposition, the Board, without reviewing the holdings in the Clinton case, made an order in accordance with this suggestion, by which the Transmission Company is to be restricted to the supply of electricity to the Adams Gas Light Company, electric railroads and railways, but shall not, directly or indirectly, supply electricity to any other customer whose aggregate rated capacity shall be less than 300 electrical horsepower, and whose annual consumption shall be less than 450,000 horsepower-hours.

In the Clinton case (Twenty-Seventh Annual Report, p. 39), which is referred to as the basis of its order in this case, the Board discusses a similar situation, as follows: "It has been the established legislative policy of the Commonwealth, that so long as such an agency for the distribution of electricity in any given territory is adequately and properly performing its public duty, the public interest is better served by public supervision and regulation than by competition. The advent of the Transmission Company into communities already supplied, for the purpose of selling electricity primarily to large consumers for manufacturing and mechanical uses, and to a considerable extent as 'secondary power,' has developed a novel and important phase of the problem with which the Board in administrating the legislative policy previously described has already had to deal. In each instance which has been brought to the attention of the Board the local authorities, as in this case, have attempted to preserve competitive relations between the new company and the one already established, but have hesitated to compel it, as a condition of admission, to observe the duties and obligations of a public servant, to serve all with adequate facilities without discrimination, and for no more than a reasonable compensation, since such a requirement, being obviously not included in the company's purpose, might discourage or wholly prevent the entry of the new company into the field for any purpose whatsoever. Anything short of an insistence on this condition must, however, inevitably fail to give the entire community the advantage of two sources from which electricity for mechanical and manufacturing purposes may be purchased. On the other hand, an insistence on this condition will probably ultimately result in no greater advantage to the community than its supply by one public service agency properly regulated and supervised."

"To put the matter more concretely, the Transmission Company came into Clinton to reach the Lancaster Mills and the Marlborough Electric Company at the Berlin line. Without these objectives it would never have sought admission to Clinton. Unless compelled by law, any sale of electricity by it to small power users will be casual and incidental merely to its primary purpose. If compelled by law to supply any one customer, there is no sound reason why it should not be required to supply all who may desire its service, and to extend its lines so far as may be reasonably necessary for this purpose. In that event, for reasons fully discussed in the Board's prior decisions, there is at least doubt whether it can charge much if any less than the prices at which the gas company can afford to sell electricity to small users of power. If, however, the Transmission Company should serve all who might require a supply of electricity from it, and should sell electricity for all purposes other than light, at prices less than charged by the Gas Company, the numerically few users of power might benefit, but the numerous users of electricity for light, including the community itself, as the most important consumer of all, would gain no advantage. In fact, inasmuch as experience has developed that low prices for electricity for light are dependent upon the extent and diversity of the use of electricity for other purposes, it seems fair to conclude that any attempt to compel these two companies to observe competitive relations may not result in any advantage to small users of power, and if it does, then only at a corresponding disadvantage to the community as a whole."

NEW YORK—Second District.

The Eighth Annual Report of the Second District Commission has been issued in bound form, covering the work for the year 1914. The report contains a discussion of telephone rate cases before the Commission, from which is quoted the following: "The art of telephony is comparatively new, and there is as yet little scientific basis or well grounded theory for telephone rate making. In common with other

regulative bodies, this Commission finds no unquestioned precedent or admittedly established principle by which to determine the reasonableness of any telephone rate. The telephone rate cases are beset with more complex and intricate problems than in the case of any other public utility.

"There is some tendency on the part of complainants to cite certain prevailing rates in other localities, states, or even foreign countries, which are lower than their own, with a consequent indication of impatience that the Commission does not forthwith order a reduction to the lowest level. But study has failed to develop such a similarity of conditions in any two points as to warrant a decision by comparison alone, except in a very few cases. To add to the difficulties of speedily disposing of these cases, the Commission lacks the necessary funds with which to make appraisals and examinations of the books of the respondent companies."

In the investigation of the rates of the New York Telephone Company the Commission was handicapped by the lack of funds. The company asked for an appraisal of its property, and offered to place moneys, up to $200,000 to the credit of this proceeding. The Commission refused the offer, which was in the opinion of its counsel unlawful. A resolution was adopted by the Commission in which it said that "it is deemed unwise and improper for the Commission to accept or use in its administration any private funds, particularly from a company whose practices and changes are under investigation and determination by the Commission." Later, a sum of $100,000 was appropriated by the legislature for the purposes of this particular case.

OREGON.

Hood River Gas and Electric Company. The Commission has rendered a decision fixing rates for electric service furnished by the Hood River Gas and Electric Company and the Hydro Electric Company. The petition asked that rates between city customers in Hood River and rural customers in Hood River Valley be equalized.

This is the first complete electric rate case to be decided by this Commission.

Former Competition.—The Hood River Gas and Electric Company, operating its system as a lessee of the Pacific Power and Light Company, was the first company in the field. The Hydro Electric Company entered the field as a competitor. The Commission says: "Immediately there began a competitive war, with the usual incidents to such form of commercial activity * * * rebates, rate cutting, flat rates entirely disproportionate to the service rendered, free service, and even physical interference with the system of the competitor. The population of Hood River City and Valley, and the nature of the local industries, largely centered around the growth and sale of apples, were entirely insufficient to support two utilities so competing for the limited amount of business which the territory could offer. Bankruptcy for both companies was inevitable. The approval of the public utilities act, November, 1912, imposed heavy penalties for a continuance of the rate cutting, rebating and grossly unjust discriminations which had been the usual strategy, and brought about a stalemate. On January 15, 1913, less than a year from the time the Hydro Electric Company commenced commercial service, the interests which controlled the Pacific Power & Light Company and the Hood River Gas and Electric Company bought the outstanding capital stock of the Hydro Electric Company. A semblance of competition between the two companies was maintained thereafter until the report of the Commissioner who audited their accounts was produced at the hearing in the present proceedings, when the Commission recommended the prompt consolidation of the two companies in fact, in the interest of economy in operation." * * *

The two companies are now both ultimately controlled, through stock ownership, as is also the Pacific Power and Light Company, by the American Power and Light Company, and there is physical connection and interchange of current between the three plants.

Losses Due to Competitive Warfare.—Under "development cost" the Commission discusses the claim of the Hydro Electric Company that during the period of operation it had failed to pay depreciation charges, operating expenses, and 8 per cent on its investment, by the sum of $29,680. The details of the computation were not presented. The Commission says: "No certain shortage can be precisely computed or accurately estimated as having actually taken place. It is, however, apparent from the record that the defendant from its organization until after its stock was acquired by the American Power and Light Company was engaged in reckless cut-throat competition with an existing utility serving the same small community; that defendant voluntarily established and long maintained rates which were not remunerative; that no attempt was made to adjust its rate so that the same should be remunerative or equal until after the utility had been purchased by the interests which controlled its competitor, and an order was made by this Commission forbidding such discriminatory and unreasonable rates; that the defendant practiced unjust discriminations forbidden by law for a considerable period after the taking effect of the Public Utilities Act; that before the consolidation of interest the defendant had consistently employed such construction methods and had so engaged needlessly in a system of competitive warfare that its fixed charges and operating expenses were unduly and improvidently increased, and that this policy prevented defendant from getting the return from its service it might otherwise have had; that since the competitive war ceased an unnecessary semblance of competition was maintained through duplicate organizations until after the hearing herein, when on the recommendation of the Commission an actual merger for operation was effected. If any shortage, of the magnitude of that claimed by the utility could be found to exist it would unquestionably be due, in chief part, to the voluntary and improvident and unnecessary actions of the owners of the utility. Under the circumstances shown in the record a shortage of return of the size of that claimed by the utility would not in any sense represent a reasonable or proper cost of developing the utility's present business or a shortage of a fair return upon the actual investment foregone by the utility pending the building up of a business. Such wasteful expenditures represent nothing of value, and have added nothing to the usefulness of the utility's physical plant.

Development Costs.—"While the Commission has been unable to ascertain the historical development cost of the utility's business, it is evident that some shortage of return would have existed, even had the utility maintained reasonable rates for its product and conducted its affairs with economy and prudence. What the precise amount would have been cannot be found as a separate item or sum to be considered as an addition to the original cost estimate made. However, reasonable consideration has been given to this item, and an allowance therefore has been included in the reproduction-cost-new estimate, as representing a normal shortage in return upon the investment represented by the reproduction-cost-new of the plant, after completion, and until the utility's business has been put upon the same basis as it now is."

Value as Basis on Rate-Making.—The valuation on which the new rates are based is $78,500 for the Hydro Electric Company and $140,506 for the Hood River Company, making a total of $219,006 for the combined plants. The value of certain duplicated property is excluded, and the original cost estimate

excludes expense items incurred in an attempt by the Hydro Electric Company to break into the field already occupied by the Pacific Power and Light Company in the neighboring City of Dallas, in 1912. The decision says: "Sums so spent, representing nothing of benefit to any consumer, are not, under the Commission's classification of accounts chargeable either to capital account or to operating expenses; but are direct charges to the corporate surplus or deficit account, and should be borne by the stockholders, whose chosen directors use such tactics in a competitive war." * * *

Minimum Charge.—"A calculation has been made as to the appropriate minimum charge for each customer under the schedules under investigation. Account has been taken of all items of expense which vary with the customer, viz.: Setting and Removing Transformers and Meters; Repair to Meters and Services; Indexing Meters; Commercial Department Salaries and Expenses, and Rent, and a fair proportion of the cost of Superintendence of Distribution and of Repairs to Miscellaneous Distribution Equipment. In addition, a ratable proportion has been taken of Production Costs, which vary with output, including operation, maintenance, and depreciation upon Production Capital and of a fair return upon such Production Capital, as representing the total expense of producing the normal average minimum amount of electricity consumed in any month, per customer. Allowance has been made for the depreciation annuity upon individual customers' meters and services, and for a fair return upon the average amount of capital invested in customers' meters and services.

"The monthly costs so computed show that the normal minimum customer costs (including depreciation and fair return) are, for Hood River customers, 91 cents, and for rural customers, $1.13. The differentiation between residence lighting and commercial lighting will not be great, and has been absorbed in the foregoing average figure.

"It is apparent that some reduction in the customer costs of rural customers can be made by the practice of quarterly instead of monthly reading of meters, with either intermediate monthly collections upon an average bill basis with quarterly adjustments, or else intermediate monthly bills based upon a reading by rural customers, transmitted by postal card to the utility, with quarterly check and adjustment by the utility's own meter readers.

"Under the circumstances in these cases, minimum monthly charges of $1.00 for Hood River customers and $1.25 for rural customers, are just and reasonable, and the utilities minimum monthly charge of $1.50 to rural customers is unreasonable and excessive."

Value of Service.—Under the heading, "Value of Service to Rural Customers" the Commission says: "It is apparent from the record, and is a fact, that any schedule of rates which might be fixed by the utilities or by the Commission so that the rural customers mentioned should pay under Schedule I a sufficient amount to yield the same return upon investment as other classes of customers, would defeat itself, because the rates necessary to yield such return would be above the value of the service, and would be in and of themselves unreasonably high, and because the effect of the attempt to impose such rates would be to decrease the consumption of the patrons to such an extent that the utilities would derive less revenue therefrom than at present."

Rates.—The rates prescribed for city residence lighting are: Eleven cents per kilowatt-hour for the first 15 kilowatt-hours per month; 9 cents for the next 15 kilowatt-hours per month; and 5.5 cents for all over 30 kilowatt-hours per month. For commercial lighting the rate is eleven cents per kilowatt-hour for current used equivalent to or less than the first 30 hours' use per month of the customer's demand; 5.5 cents per kilowatt-hour for all in excess of 30 hours' use per month of the customer's demand.

A separate schedule was prescribed for rural domestic lighting and power, as follows: Thirteen cents per kilowatt-hour for the first 30 kilowatt-hours used per month; 9 cents per kilowatt-hour for the next 30 kilowatt-hours used per month, and 7 cents per kilowatt-hour for all over 60 kilowatt-hours used per month.

Under the rates for residence lighting cooking appliances may be connected not exceeding a total connected load of 2 kilowatts. An optional cooking rate was provided of 5 cents per kilowatt-hour subject to a minimum charge of $1.00 per month.

The above rates are gross, and there are prompt-payment discounts in each schedule. These rates are effective as of August 1, 1915.

WEST VIRGINIA.

Standards of Service. The Commission has adopted and published in pamphlet form rules and regulations governing electric, gas and water utilities, to be effective as of August 1, 1915. General rules for electric utilities, applying to operation and maintenance, provide that each utility shall maintain its plant and system so as to furnish safe and adequate service, and that construction shall be in accordance with the National Electrical Code and good standard practice. Rules are given governing the location of meters, the testing of meters, and meter records and reports. A copy of the complete schedules of rates, a copy of the Commission Law and a copy of these rules and regulations are to be provided in the office of every utility for the information of the public, and the rules also provide for information to consumers regarding reading of meters, consumers' bills, lamp service and kinds of service furnished by the utility. Other rules apply to standard voltage, standard frequency, voltage and current surveys and records, station records and interruption of service, and accident reports. The following are a number of the rules applying to meters and meter testing and other matters of general interest:

The Commission rules that after January 1, 1916, no electricity shall be furnished and sold within the state of West Virginia, except by metered service. This does not apply to window, outside decorative lighting, street lighting, transient consumers where the wiring furnishing such service is entirely separate from the wiring inside of buildings, used for general lighting purposes, and limited service as now furnished by the use of excess indicators or similar devices. For good cause shown, the Commission will allow exception to this rule in special cases.

Another rule applying to electric utilities provides that: "Any utility may require from any consumer or applicant a minimum cash deposit of $2.50 or other guaranty of an amount not to exceed the estimated 60-day bill of the consumer. Interest thereon at the rate of six per cent per annum, payable upon the return of the deposit, shall be paid by the utility to every consumer making such deposit, for the time such deposit was held."

Rules for testing of electric meters cover installation tests, periodic tests, request tests, and complaint tests.

"No watt-hour meter that has an error in registration of more than two per cent, plus or minus, at either light load or heavy load, shall be placed in service. Whenever, on installation, periodic or any other test, a meter is found to exceed these limits, it must be adjusted so as to register correctly to within two per cent at light load and at heavy load and to be without creep, and refund made."

For the determination of the average percentage of accuracy the meter is to be tested at two loads, one-tenth of the full rated capacity, and full rated capacity. The average of these tests is taken to be the condition of the meter.

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 296.—HIGH COST OF RENDERING BILLS.—I understand that in the case of some of the large central-station companies it costs on an average from 16 to 18 cents to render the ordinary monthly bill for current used. What is the reason for this high cost? What efforts have been made to reduce it?—D. L., Chicago, Ill.

No. 297.—ELECTRIC STABILIZER FOR STEAMSHIPS.—I have heard that motor-driven gyroscopic stabilizers have been used with success on some German steamships to diminish their rocking during violent storms. In view of the appalling disaster to the Steamship *Eastland* in the Chicago River on July 24, would the use of such an electric stabilizer have prevented the rapid listing of the boat and been more reliable than water ballast?—T. M. E., Evanston, Ill.

No. 289.—GELATINOUS BATTERY ELECTROLYTE.—In some types of small storage batteries made especially for use where they are likely to be upset there is used some sort of jelly-like paste instead of the ordinary liquid electrolyte. What is this paste composed of? Does it increase the internal resistance of the battery? What effect, if any, has it on the efficiency, capacity and life of the battery? —C. M., Jackson, Mich.

No. 299.—PROTECTING THIRD RAIL.—What effective means, aside from using the inverted third rail, can be used at highway crossings of an electric railway equipped with the ordinary upright third rail to prevent pedestrians from entering on the right of way at the crossing and coming in contact with the live rail? This right of way is fenced in except at the crossing gaps, where the third rail is interrupted and cattle guards are provided at each side of the crossing.—W. R. A., Elmhurst, Ill.

Answers.

No. 287.—POWDERED COAL AS CENTRAL-STATION FUEL.—Recent experimental trials with powdered coal as steam-boiler fuel are said to have given almost ideal results from the standpoint of combustion efficiency. Has this fuel been tried on any extensive scale under the boilers of any large or medium-sized central station? Is the method applicable advantageously to all kinds of coal? Is the cost of the crushing plant offset by the increase in efficiency?—B. A. M., Toledo, O.

While considerable data are available covering the use of coal-dust in metallurgical plants, reverberatory furnaces, etc., little has been published concerning its use under central-station boilers. Perhaps the chief reason for this is that pulverized coal or coal-dust is only being used to a very limited extent, and only in isolated cases, by central-station companies, and then on a comparatively small scale. In the early stages of the development of burners for coal-dust much trouble was encountered, but it was incidental rather than fundamental. The chief sources of difficulty were due to the stoppage of the flues due to an accumulation of ash, and interruptions and irregularities in the quality of the coal supply; both of these were directly traceable to lack of appreciation of the importance of uniform fineness of the coal-dust supply. However, these troubles are now of the past. For satisfactory results to be obtained with powdered coal there are several points that must be taken into consideration. While the choice of coal, as with any other form of burning, should depend upon the heat value, ash, moisture, volatile matter, fixed carbon, etc., it may be said, speaking generally, that any coal will be satisfactory so long as it contains enough volatile matter to give the required combustion. There are numerous grades of powdered coal in use in many different parts of the country, in various makes of burners, furnaces and boilers, that are giving satisfaction. The choice of coal has little bearing upon the operation, as compared with the importance of the design of the installation. It is important, however, that the coal be dry, the drier the better, if the looked-for efficiencies are to be obtained. With any form of coal, all moisture must be evaporated before the coal will burn. The furnace is the most expensive place in which to dry the coal on account of the loss of thermal efficiency thereby. With coal-dust firing a separate drier should be used; it not only increases the efficiency of combustion but results in a saving in power consumption of the pulverizer, since dry coal takes less power to crush than does moist coal. Coal surface and burning efficiency are very closely related, and the importance of grinding the coal sufficiently cannot be emphasized too strongly. The effect of pulverizing the coal is well brought out by C. D. Demond, testing engineer, Washoe Reduction Works, who said, "The approximate diameter of a one-pound lump of bituminous coal is three inches, and its total surface one-quarter of a square foot, while one pound of coal ground so that 95 per cent will pass through a 100-mesh sieve and 82 per cent through a 200-mesh sieve has a total surface of 8,000 square feet, more or less, depending upon the physical characteristics of the coal, or 32,000 times the area of the single lump." The commercial standard of fineness for pulverized coal is that 85 per cent must pass through a 200-mesh sieve, and 95 per cent through a 100-mesh sieve. With any fuel it is necessary that proper quantities of air be admitted at all times, if the thermal efficiency is not to be lowered; this is particularly so in the case of firing with coal-dust. If too much air is admitted the gases are diluted and the temperature is lowered; whereas if insufficient air is allowed to enter part of the fuel is incompletely burnt, resulting in a loss in efficiency.

In a plant utilizing coal-dust or pulverized coal the auxiliary apparatus is greater than would otherwise be required. The apparatus should be of the best, and should be carefully chosen so that each part performs properly its function. When burning coal-dust trouble to one piece of equipment will affect the whole installation usually. In a coal-dust-fired plant the disposal of the coal is somewhat as follows. From the coal-storage bins the coal is fed to the crusher, where it is broken up into pieces about one-inch maximum. The coal is then conveyed to the drier, going thence to the pulverizer, where it is crushed to the desired size. It then is conveyed, usually by forced air, to the storage bins above the boiler or furnace. The use of coal-dust results in higher furnace efficiencies being obtained, it is more easily regulated, and requires less labor expense than when lump coal is used. On the other hand the investment in auxiliary apparatus is greater. Whether the extra cost is justified is a matter that can be determined only for each individual case. The indications are that it is in an increasing number of cases.—I. L. K. R., Chicago, Ill.

No. 289.—COMBINATION ELECTRIC RADIATOR.—I have just heard of a newly patented electric radiator which resembles a hot-water radiator and has an electric coil heat the water in the pipes; it is said to be more economical than a straight electric radiator. I fail to see this and would like to have it proven. —W. T., Cleveland, O.

In the case of straight electric resistance heaters, as soon as the current is turned off the heat leaves the heater very rapidly. In the case of a heater in which water is used, the heat is stored up in the water and given out more slowly, hence, where it is necessary to keep constant temperatures with a fluctuating current or where it is desired to turn off the current in the evening the heat energy stored in the water is given out as the room temperature lowers. This helps keep the temperature from falling below a certain value. The reason for

the use of water for heat storage is on account of its high specific heat compared to metal. In a comparison of two heaters of equal heating value I have computed the following: Heat stored with bare heaters, 455 British thermal units; heat stored with 25 pounds water in heater, 5,200 British thermal units; time required to attain room temperature from equal starting temperature above that of the room—without water, 12 minutes, with 25 pounds water, 2 hours and 10 minutes. If W. T. will test the radiators he can see for himself that the water type would be best where it is necessary to cut off current and still maintain heat. Where instantaneous heating, however, is requisite a non-water type must be chosen.—H. E. W., Chicago, Ill.

No. 291.—Insulation of Underground Piping.—It is often claimed that covering underground pipes with a coating of paint is an effective measure against electrolysis. Since paint is supposed to be an insulator, why is it not more often used?—G. D. K., Chicago, Ill.

Speaking generally it may be said that covering an underground pipe with paint will afford very little protection against electrolytic action for any length of time. When trouble first was encountered from electrolysis it was thought that paint, on account of its being classed as an insulator, would be most efficacious for mitigating the evil effects of the electric current. It was tried very extensively. In some cases it proved apparently quite satisfactory, in others again it deteriorated rapidly and the pipes were found to have been attacked more severely than if no paint had been used at all. In some instances when tried in the same town, in one locality the paint offered protection for a time while in another locality it failed utterly in a very short while. In practically all instances the result was finally the same, namely, utter failure after comparatively short service.

The deterioration of paint when used underground may be traced to either of two causes, the chemical action of the soil, or electric currents. Of the two, though both may exist at the same time, experience indicates that the latter is by far the more deleterious, the chemical action of the soil having comparatively little effect. Practically no paint is absolutely impervious to moisture, and it seems now to be quite generally thought that this is the source of the comparatively short life of paint-covered pipes and metals. More or less moisture is usually present in soils, with the result that where it exists for any length of time it will permeate the coating of paint. Under these circumstances the covering is no longer an insulator but becomes a conductor, or semi-conductor, of electricity. If a difference of potential exists, a current will flow. At first this current will probably be very small, but with the electrolytic action taking place gas formation will also occur; the gas given off, as it increases in volume, will finally rupture the covering of paint, thereby permitting a greater current to flow, which still further increases the electrolytic action.

In a number of instances covering pipes with paint has been found to cause more damage than had the pipes been left exposed. The reason for this is that the paint breaks down at isolated places. At such leaks the current density will tend to be high, with the result that severe pitting and corrosion takes place at one or two places instead of being over a more extended area. The life of the pipe is thus shortened by painting. In practice it is not uncommon to have trouble with a pipe that looks to be in first-class condition on a superficial examination, but on scraping away the paint the metal is found to be badly eaten away. This is explained by the fact that the covering of paint is porous, thus allowing the gas which is given off during electrolytic action to escape as fast as generated.

It has been shown that covering pipes with paint is not really an effective way of eliminating damage from electrolysis, and that furthermore its use may cause a more rapid disintegration than would otherwise occur. There is a field, however, for the use of paint as a protective coating, where it might be used to good advantage. It is in those cases where pipes are neutral or negative to the earth. Under these conditions the paint will tend to prevent the current from taking to the pipes or, if it does, little harm results. When a paint can be made that is impervious to moisture and that will remain so for a reasonable length of time, an immense step will have been made toward solving the problem of electrolysis and corrosion of pipes in our large cities.—K. R., Chicago, Ill.

The plan of painting the surface of pipes, cables and other underground metallic structures has been used in a great many cases in the past as a possible means of protection against electrolysis, and this method is still used in some cases. It has been found by experience, however, and may be shown by experiment, that the use of paints or insulating varnishes for this purpose is unreliable and may in some instances become actually injurious. This does not, of course, apply to protection against soil corrosion where there is no difference of potential between the metal and the surrounding soil, and in such cases the application of several carefully applied coats of good water-resisting paint will be very effective.

The conditions are very different whenever stray currents are present, for the reason that, so far as is known, no paint is commercially available which is absolutely impervious to moisture. Therefore, when a metallic structure, such as a gas pipe, water main or lead cable, is painted and placed in the earth in the presence of water a slight trace of moisture ultimately permeates the coating. When this occurs at any point, the coating becomes slightly conductive and if there is any difference of potential between the metal and the surrounding soil, a trace of current will flow, giving rise to a slight electrolytic action accompanied by the generation of more or less gas beneath the coating. As the action continues the gas increases in amount, resulting in an eventual rupture of the coating, after which the current flow is greatly increased at the point of breakdown and rapid electrolysis of the exposed metal usually follows.

If the coating is porous, thus permitting the gas to escape, the coating may remain intact and the electrolytic action may continue and may finally eat through the metal without giving any superficial evidence of the condition. Furthermore, if the coating is sufficiently porous to permit the escape of gas, the action would be considerably more rapid than would otherwise be the case, due to the greater absorption of moisture and consequently greater degree of conductivity. On the other hand, if the coating is not sufficiently porous to permit the escape of gas, the rupture or cracking of the coating above mentioned will take place at isolated points, so that the discharge of current from the metal is concentrated and the pitting is therefore likely to be more serious than if paint were not used at all. Ordinarily, evidence of electrolytic action on painted underground metallic structures is given by the presence of blisters or cracks on the painted surface.

The foregoing refers entirely to structures which are positive to earth. There might be some benefit derived from the use of insulating paints, if they could be applied to the structure at points where it was continuously negative to earth, i. e., where the tendency of the current was always to flow from the soil to the underground structure, as in this case the total current flow in the structure would be somewhat reduced and the electrolytic action in the positive area would therefore be decreased. Points where an underground metallic structure is continuously negative to earth seldom occur in practice, due to changes in distribution of load on the trolley system or other source of the stray currents, and areas which are negative at one time become positive at another. In general, therefore, the use of paints as a means of protection against electrolysis of underground metallic structures cannot be considered a satisfactory plan.

A long series of tests on this matter were made some time ago by McCullom and Peters of the United States Bureau of Standards and are published by the Bureau as Technologic Papers No. 15, entitled "Surface Insulation of Pipes as a

Means of Preventing Electrolysis."—H. S. P., Bloomfield, N. J.

No. 292.—SUNSPOTS, MAGNETIC STORMS AND WEATHER.—A short time ago a statement appeared in the newspapers that an exceptionally brilliant display of the aurora borealis was connected with great activity in the sunspots and that it also produced serious disturbances on telegraph circuits and magnetic compasses and accounted for our prolonged rainy weather. Has any definite conclusion been reached by astronomers, meteorologists and other scientists as to the interconnection of these phenomena? Is there any basis for ascribing an electrical or magnetic relation between them?—F. L., Beloit, Wis.

The correlation between sunspots and the earth is perfectly proved. During the greatest activity of sunspots (i. e., when they are most numerous or occupy the maximum portion of the sun's surface) magnetic disturbances, commonly called "magnetic storms," are most numerous and intense, and, as W. Ellis in the *Philosophical Transactions* and before the Royal Society of London has shown, the regular *daily* variations of terrestrial magnetism are also greatest; in many instances also (but not always) notable disturbances upon the sun have been accompanied by violent magnetic storms and earth currents, with brilliant displays of the aurora polaris (as, for example, in the years 1859 and 1883). The fact of the connection between terrestrial magnetism and solar disturbances is beyond doubt, though the exact nature and mechanism of this connection is still a matter of debate. As far as the authorities to the writer's hand are concerned it is not definitely known whether the solar disturbance causes the terrestrial, or whether both of these are due to some external influence, as, say, that of the planets in general, or extra-solar systems.

There also has been a great deal of discussion on the relation between solar disturbances and possible effects upon the earth's meteorology, upon its temperature, barometric pressure, storminess, and amount of rainfall. Here again it only can be said that the matter is still on debatable ground, though the last work of Simon Newcombe before his death in 1909 discussed the meteorological evidences as to variations of radiation of heat from the sun, ending with the conclusion that the minimum temperature on the earth occurs 0.65 year after the maximum of sunspots, whereas our maximum temperature occurs 0.33 year before the minimum of sunspots. He infers that there may be fluctuations of plus or minus two-tenths of one per cent in the earth's temperature, but, as above intimated, whether this terrestrial phenomenon is due to variations of solar radiation or of atmospheric conditions is still problematical. A number of other excellent authorities have seemed (at first glance) to have established conclusive facts, but other evidence would refute them as far as we at present know. Thus, "while some particular investigations appear to show a correspondence for a time, others contradict them." On the other hand, "it is not antecedently improbable that some real connections exists."

As to theories of sunspots and their effects on the earth's meterology and magnetism, there are quite a number; only those of magnetic or electrical foundation will be mentioned here.

E. W. Maunder collected and arranged data which he regarded as demonstrating that magnetic disturbances originated in the sun. He regarded the solar action as arising from active areas of limited extent on the sun's surface, and as propagated along narrow, well defined streams. The active areas he believed to be also the seats of the formation of sunspots, but believed that activity might precede and outlive the visible existence of the sunspot. Maunder did not discuss the physical nature of the phenomenon, but his views are at least analogous to those propounded somewhat earlier by Svante Arrhenius, who suggested that small negatively charged particles are driven from the sun by the repulsion of light and reach the earth's atmosphere, setting up electrical currents, manifest in auroral and magnetic disturbances. Kr. Birkeland believes the vehicle to be cathode rays, while Ch. Nordmann similarly has suggested Roentgen rays. In line with the last two theories, evidence is accumulating to show that the sun and stars are radio-active bodies, and that emanations proceeding from the sun, and reaching the earth, have important relations to the phenomena under discussion. The electron theory has been extended to include the present case, and auroral displays have been performed in the laboratory with radio-active apparatus.—P. B. W., Verbena, Ala.

No. 293.—BELL-RINGING TRANSFORMERS AND LIGHTNING.—Recently we installed several bell-ringing transformers and a number of them have already been burned out during a lightning storm. Is there any simple and yet positive way of protecting them against lightning? We will be much pleased if some one will answer this through your Questions and Answers columns.—H. P., Hillsboro, Ill.

If the transformers and their secondary lines are inside, it would indicate that your power line was poorly protected and I would advise more, or at least some, lightning arresters on the lines as well as at the station. If the bell-ringing or secondary lines are run outside, use an extra-heavy telephone arrester, such as used for block signal, telegraph and telephone composite systems.—H. E. W., Chicago, Ill.

No. 294.—ALARM FOR AIR-BLAST TRANSFORMERS.—A railway substation has a bank of air-blast transformers that are now unprotected against failure of the forced ventilation at times of heavy load. What is the simplest and most reliable alarm system for this purpose?—N. P. C., Indianapolis, Ind.

Probably the best solution would be the use of the Thermo relay, either as a closing device from alarm circuit or for operating directly a circuit-breaker and cutting out the transformer bank. The Thermo-relay devices are made by the Baruch Electric Controller Corporation, 111-117 Kearney Street, San Francisco, Cal.—H. E. W., Chicago, Ill.

Air may fail to pass through air-blast transformers either because the dampers of the transformer are closed or on account of cessation of the air supply due to the stopping of the blower. To assure the opening of the dampers, many companies have a very strict rule requiring that operators must always pass round a transformer bank, feeling the air, as soon as the bank is placed in service. And further, that transformers must be inspected for temperature and continuity of air supply every half hour during heavy load periods, and at hourly intervals at other times.

A very simple and inexpensive device for indicating the passage of air through a transformer consists of arranging two feathers somewhat like the arms of a windmill, fastening them on a piece of wood which is placed in the air passage on the top of the transformer. A piece of tape about a foot long also answers.

Another method is to install a U-shaped tube in the transformer air duct, or where desired. This gauge may be calibrated in pounds per square inch, if desired. Also it may have contacts placed in it that will close a bell circuit at the cessation of the air supply or a reduction thereof. Some companies place these gauges at the operator's desk, others install contacts for an alarm circuit.

Probably the tape or feather methods are the most usually installed. The gauge method, whether working as an indicator or as an alarm is good, but rather expensive to install. The most desirable combination is to install a gauge fitted with an alarm in the blower passage, and place tapes on the individual transformers. It is not enough that the air should flow, but it is very important that the temperature of this air be kept below safe limits. That is the reason, in a large part, for the periodic inspection discussed above. It has been found by experience that it is not a good policy to remove too much responsibility from the operators.—K. R., Chicago, Ill.

Good Roads to Reduce Cost of Living.

Taking the country as a whole, it is said that three-fourths of all the freight our railroads haul must sooner or later be moved over the public highways, and every ton so moved is costing at an average rate of 23 cents per mile. This is a powerful argument for good roads in order to reduce the cost of living.

Convention of Ohio Electric Light Association.

Cedar Point is Scene of Twenty-first Annual Meeting, July 20 to 23.

The twenty-first annual convention of the Ohio Electric Light Association was held at the Breakers Hotel, Cedar Point, O., July 20-23. The total registration of active and associate members, ladies and other guests, was 392, which is but little short of the records of previous years. The customary program of business sessions was carried out, and the entertainment features arranged in the usual way. A banquet was held on Wednesday evening and dancing was indulged in on Tuesday and Thursday evenings, preceded by musicales rendered by Mrs. Clara T. Grimes. On Wednesday afternoon an illustrated lecture was given by Cy B. de Vry, superintendent of the Zoological Department of Lincoln Park, Chicago. On Thursday afternoon there was a bathing party, with a ball game, duck races and other contests. Bowling and card parties were provided for the ladies.

The first session was called to order by President C. V. Hard on Tuesday at 2:20 p. m. Vice-president W. J. Rose was called to the chair while Colonel Hard delivered the presidential address, in which he pointed out the growth of the industry and of the association, which now has over 300 members. He stated that over $100,000,000 is invested in central stations in Ohio, and if all electrical industries are included the figures exceed $225,000,000. The work of the various committees was referred to, great activity having been manifested by all. Referring to the relations between the utilities and the public, he said that the choice lay between government ownership and government regulation, and the latter is decidedly preferable. Government ownership should be actively opposed.

The report of D. L. Gaskill, secretary-treasurer, showed the association to be in good financial condition, there being a surplus for the year of over $500. The *Monthly* is self-supporting. The work of the Appraisal Committee should be continued. He read a list of contributions to the special fund of $2,735 raised for this work, to which $329 was added from the general funds.

This report was referred for audit to a committee consisting of L. K. Funkhouser and F. J. Jackley.

J. C. Martin made an oral report for the Executive Committee, referring especially to the legal work and efforts to influence legislation. Municipally owned utilities are now required to keep accounts the same as privately owned utilities. Only one financial report a year is now required for all state purposes. No adverse legislation was passed by the last legislature. Co-operation with other utilities is desirable in this work.

New members were then elected. A Nominating Committee was appointed by the Executive Committee, as follows: G. E. Miller, of Cleveland; E. A. Bechstein, of Sandusky; O. H. Hutchings, of Dayton.

S. E. Doane then presented the report of the Illumination Committee. This was very brief, as letters in the *Monthly* from time to time have kept members informed of important developments. Correspondence has also been carried on directly with members on various phases of illumination.

The discussion by D. L. Gaskill, O. H. Hutchings, L. C. Anderson, F. C. Jeannot, W. R. Power and Mr. Doane, brought out that while the light source in type C Mazda lamps is smaller than in earlier types, it is aimed to get the same distribution of light by reflectors of the prismatic and mirror types. Street lamps on Euclid Avenue, Cleveland, have the two elements of the refractor sealed, so that dust cannot accumulate between. With alternating current, type C lamps can be operated in series with arc lamps, but this has not been successful with direct current, especially with magnetite lamps. Mr. Power, however, claimed satisfactory operation in the latter case, with a life of over 1,000 hours.

Mr. Doane also presented the report of the Committee on Standardization of Voltages.

Standardization of Voltages.

This report shows the reasons for the choice of a variety of operating voltages in the early days and the desirability of reducing this to a limited number now that lamp manufacture is better standardized. Steps to secure this result should be taken by operating companies and a full discussion of the question is asked and action proposed to bring all Ohio central stations within the range of 110 to 120 volts, concentrating upon 110, 115 and 120. It is also recommended that other state organizations should be induced to take similar action and the change made general throughout the country. The various factors to be considered in this connection are discussed and an appendix given showing the effect of increased and of decreased voltage on various apparatus. The question is also raised as to what extent the co-operation of isolated plants should be solicited.

This was discussed by L. C. Anderson and G. E. Miller. Mr. Doane stated that replies from manufacturers of heating devices indicated little interest in the subject. A motion was passed accepting the recommendations of the committee and instructing the secretary to request similar action by other state organizations. It was also voted to continue the committee.

D. L. Gaskill then made a report for the Insurance Committee, urging its continuance to cover liability insurance.

T. O. Kennedy, of Masillon, stated that boiler insurance formerly covered both property and casualty damages. Under the present law, injury to employees is no longer covered, but the rates are as high as before.

There was a discussion as to whether an employee has the option of a suit for damages under the compensation law, indulged in by D. L. Gaskill, F. C. Dunbar, E. A. Bechstein, G. E. Miller and J. C. Martin. The latter stated that he has this option unless he has filed an application with the Industrial Commission, in which case he is barred. Employers should take an interest in the amount of allowances for injuries, since these affect their future premiums and those of the entire industry as well.

The session on Wednesday morning opened with a general discussion of "Every-Day Problems Confronting the Central-Station Manager."

D. L. Gaskill, of Greenville, spoke regarding public policy. Much of the present antagonism to utility corporations is due to the lack of such policies twenty years ago. The problems are entirely different in the large and small companies. In the latter the personality of the management is a large factor. In the former, printer's ink, courteous treatment by employees, and good service count heavily. The confidence of the public is a great asset and should be retained as far as possible. Good service is the first essential, but the public should be kept informed of what the utility is doing for the public benefit. Utilities should convince the public that they are trying to be fair.

Weare Parsons, of Springfield, spoke on organization. A manager must see that service is rendered and must be able to stand abuse. He must also protect the people he represents. He should be able to select and discharge his assistants, and should be able to take up the details of the work when necessary. Mr. Weare advocated rivalry between different departments, and the computing of unit costs by each. The manager must also deal

with municipal and state bodies. He had found the latter satisfactory, but difficulties with the former are often due to indefinite franchise provisions. In ruling with respect to extensions, neither extreme is desirable. He thought extensions were warranted only when the gross annual return is equal to the capital outlay. It is not desirable to strive hard for suburban business. Rates should be flexible enough to meet all cases, and should be promptly quoted. A study of load-factor and station load curve will often indicate lines of business which may profitably be taken on.

W. R. Power, of Huntington, W. Va., cited cases of courteous treatment by employees and the reverse and showed how public sentiment is influenced by such things. He favored liberal extensions.

T. O. Kennedy, of Masillon, agreed with Mr. Gaskill that present troubles are largely due to past misconduct. The company organization should first be convinced that the old attitude has changed, and then the public should be convinced. Let them know what you are doing. Chautauqua meetings might be a good medium for public information. It is a fine thing to have such cordial relations with customers that one can call on them to block malicious legislation.

G. E. Miller, of Cleveland, discussed extensions and said that many had been made in Cleveland suburbs where the annual gross revenue was only 10 to 25 per cent of the investment.

Mr. Parsons said that if gross revenue did not equal investment, extensions were made in Springfield only when customer paid for extension, this being refunded when business reached the required value. There is no reason why the company should carry such an investment.

F. C. Caldwell, of Columbus, suggested that when an extension is not feasible, a farm-lighting outfit be recommended.

J. C. Martin, of Columbus, spoke on municipal ownership, which is likely to be agitated in every community at one time or another. It should be forestalled by appropriate publicity. He cited one large corporation which gets all newspaper clippings referring to its operating companies. If these are untrue, they are refuted through the same channels. If they are favorable they are reprinted in other papers. An example of publicity work was given in connection with the opening of the transcontinental telephone line, which was heralded all over the country. The association should consider organized work along this line.

George Whitely urged a clean house and good service. Then the public will stand by the utility.

There was then some discussion as to permanent representatives in Columbus and the need for utility managers being in touch with legislators.

M. H. Wagner then presented the report of the Committee on Transmission and Distribution.

Report on Transmission and Distribution.

This report emphasizes the necessity for care in handling insulators as the smallest nicks reduce the factor of safety. Changing insulators after a line is in operation is much more expensive than the first installation. To handle without chipping carriers should be supplied which prevent the rocking of the insulator. When placed upon the ground they should be in such a position that they will not accumulate rain which by freezing might cause cracking. Insulators usually fail for mechanical reasons. A demonstration was given of a set of tools which permits changing a high-tension pin-type insulator without interruption of service. A megger is useful for detecting defective insulators in service. Insulators in guy lines should be omitted where the voltage exceeds 5,000, the anchor itself forming a ground. A discussion is given of the desirability of single and of duplicate lines and of the location of trouble and emergency repairs. A ground wire and electrolytic lightning arrester are advocated for high-voltage lines. For outdoor installation the electrolytic arrester has the drawback that the electrolyte freezes at about 15 degrees Fahrenheit. Multigap arresters are advocated where an attendant is not at hand to charge the arrester daily. Guards are proposed on farm lines to prevent boys from climbing the poles. Apparatus at transformer stations should be fenced in. Greater attention should be given to primary and secondary distribution lines by small companies. The unjt method of distribution is proposed with the use of one large transformer for a district rather than a large number of small transformers. No service wire smaller than No. 8 should be used. Different types of insulators should be used for primary, secondary and arc lamp lines. Terminal boards should be eliminated from transformers. A discussion is given of the relative desirability of single-phase two-wire or three-wire, three-phase three-wire and three-phase four-wire distribution from a three-phase primary. Tests on different forms of grounds are given, showing the contact resistances. It is concluded that secondary systems should be grounded to water pipes wherever possible, and when this is not possible, two or more ground connections should be provided.

The discussion was opened by W. E. Richards, of Toledo, who questioned the advantage of double circuits on the same poles. He referred to the grounding of secondary circuits, which should be done at only one point when electric railways are in the vicinity, or else stray currents will be circulated in the system. He also discussed underground transmission, which was not considered in the report. This gives greater continuity of service and is feasible up to 25,000 volts.

E. E. F. Creighton, of General Electric Company, discussed insulators. He stated the requirements for the porcelain, which must be vitrified at a higher temperature than table ware. Damage is occasioned by the metal fittings on account of the difference in expansion and contraction with temperature. To detect faulty insulators the oscillator has been developed. It utilizes 500,000 cycles from a Tesla transformer. The test does no harm to good porcelain, but breaks down the cracked ones, even when these would pass a 60-cycle test. Another test is to measure the insulation resistance with a megger. This test will detect defective insulators when moisture is in the cracks, but not when dry, as is sometimes the case with pin-type insulators. There are several sizes of oscillators, the smallest being portable and suited to testing insulators in position on the line. This should be done once a year.

C. R. McKay, of Cincinnati, submitted written discussion.

H. H. Rudd, of the Westinghouse Electric & Manufacturing Company, spoke of the choice of a secondary distribution system, which must be suitable for a small or large system, must supply both lighting and power at standard voltages, must operate at a voltage high enough for economy and low enough for safety, must have a neutral point grounded, and must provide for fuses. The report gives four possible systems: two-wire, single-phase; three-wire, single-phase; three-wire, three-phase; four-wire, three-phase. Where polyphase current is required, he suggested as superior to any of the above a five-wire, two-phase system, which meets all requirements for single-phase and polyphase, neutral wire, and standard voltages.

A. O. Austin, of the Ohio Insulator Company, said the importance of insulators was two-fold: with increasing age of line they are likely to give greater trouble, and as lines increase in extent, the same percentage of faults occasions more interruptions. Insulators are worked at a low factor of safety, considering which the results are remarkably good. He explained the weaknesses of insulators and the troubles from expansion. Trouble is often occasioned by tying in an old and crippled line with a new one. The cripples should be weeded out by testing in position. Most troubles occur in warm weather from lightning.

At the close of the session Professor Creighton gave a demonstration of testing insulators with the oscillator, a portable type weighing 200 pounds being used.

R. P. Anderson, with the help of a crew of three men, gave a demonstration of replacing insulators and cross-arm on a live line using pin-type in-

sulators. Three insulators were removed, a cross-arm replaced and wires tied up to new insulators in 25 minutes. The necessary tools have been used for some time without accident on the 33,000-volt line of the Western Ohio Railroad. The tools for this work are made by the Cronin Electrical Appliances Company, Wapakoneta, O.

At the session on Thursday morning Vice-president Rose occupied the chair. E. Burt Fenton presented a paper entitled "Snuggling Up to John Smith." This discussed the best methods of securing the good will of the community and creating public sentiment favorable to the utility corporation. An abstract of this paper was given in the last issue.

The discussion was opened by Thomas F. Kelly, of Dayton, who complimented the paper and pointed out that some managers accept the principles laid down, but fail to carry them out in their own organizations. Every manager should find out what is being done in his own company. He proposed a suggestion box in the company's office for the use of customers, as done at Dayton, where the "public-be-pleased" policy is in force. He gave a list of "Don'ts" to be observed by meter readers.

E. W. Doty, now with the Columbus Railway, Power & Light Company, pointed out the necessity of pleasing the women. The attitude of meter readers is more important than that of managers. The suggestions of the paper constitute an effective campaign against municipal ownership. It is necessary to let the public know what the company is doing and why it is doing it.

H. B. Bixler, of Akron, also considered Jane Smith an important factor. The more frank you are with customers, the better they like you. If people take time to come and ask questions, time should be taken to satisfy them. He has found the minimum charge a large source of complaint.

T. O. Kennedy, of Massillon, emphasized the necessity for publicity. The association should take up the matter of a state-wide campaign, and have a lecturer available for club luncheons, meetings of chambers of commerce, etc.

D. L. Gaskill, of Greenville, said that John Smith must be convinced that the company is trying to please him. He advised every manager to look over his business and remove any irritations that might exist. He considered a written application for service entirely unnecessary for new customers. The public must be educated along utility lines even though they do not know it. Central-station men should be proud of their business and ready to talk about it at any time to club meetings, etc. They should also buy advertising space in newspapers, and tell the public about their business, even in the smallest communities. Great attention should be given to the metermen, as they are continually in contact with the public. In small towns, the company president should know a large proportion of the customers personally. There should not only be inspection of premises on complaints, but periodic visits to see if service is satisfactory.

Mason H. Lytle, of Piqua, thought some educating of the public should be done with respect to rates, and why they are different for power and residence lighting. The customer should be convinced that there is no more profit in the latter than the former.

W. R. Power, of Huntington, agreed with Mr. Gaskill that a written application is not a necessity, but he regarded it as desirable for getting correct names, etc. His company takes the application blank to the customer upon telephone request. One or two chronic kickers are useful in keeping an organization keyed up to the highest efficiency. Delinquent notices should be worded as diplomatically as possible and not be irritating. Managers and commercial representatives should be good mixers, and should be members of local organizations.

F. C. Caldwell, of Columbus, said it was desirable to provide means for a customer to get a complaint out of his system. Complaints are useful to the company in pointing out defects in service and weak points in methods. Employees should realize that they can be public educators on electrical matters.

H. Whitford Jones, of Cleveland, cited an example of publicity in connection with a rate adjustment. In one case where municipal ownership was under discussion, a report on costs, with comparison of company service, was sufficient to defeat it. It pays to explain things fully to the public.

The report of the Meter Committee was then presented by A. H. Bryant.

Report of the Meter Committee.

This report consists mainly of a paper by W. A. Halliday, presented at one of the committee meetings, on methods of test and errors involved in metering loads requiring instrument transformers. An error of five per cent may be introduced by the use of transformers not adapted to the work. Opening the secondary circuit of a current transformer may affect its accuracy and is also a source of danger. Four methods of testing are considered: (1) testing meter only and neglecting errors of transformers; (2) testing meter only but applying average correction of type of transformer used; (3) testing meter only and applying predetermined corrections of particular transformers used; (4) testing meter and transformers together as a unit. The first method permits large errors and the average error may be as much as 2.5 per cent. By the second method the errors should be kept under 0.6 per cent. Phase-angle errors may be added to these errors of ratio when the power-factor is low. The accuracy of the fourth method depends upon the testing apparatus used. It may seem ideal, but has the disadvantages of danger, necessity of extra equipment, difficulty of controlling load, complications in determination of standard values, liability of interruptions to service, and additional cost of testing. The first method is the simplest, and will do for some installations. Otherwise the second method is to be preferred for all except special cases. Interconnections of secondaries should be avoided wherever possible.

The committee has also drafted a suggested set of rules and regulations governing watt-hour meters, which are given in the report. This was done at the request of the Executive Committee for presentation to the Public Utilities Commission.

The discussion was opened by William Bradshaw, of Westinghouse Electric & Manufacturing Company, who spoke of instrument transformers, a subject of national importance. Cheap transformers should not be secured for important installations, but rather those with good characteristics, whose errors can be neglected in testing. While corrections can be accurately determined, the conditions of use, such as power-factor, are variable, so that the result is only an approximation anyhow. The manufacturer calibrates both transformers and meters for average conditions. He knew of one man being killed by opening the secondary of a current transformer. He favored approximate methods of testing instrument transformers as the central station is hardly justified in the expense of apparatus for null methods. He did not favor self-contained meters for currents as high as 300 amperes, as they are difficult to test and more sensitive to external fields and to short-circuits.

E. A. Wagner, of the Fort Wayne Electric Works, spoke of the sources of errors in instrument transformers. In potential transformers the primary winding is of greatest importance, while in current transformers the secondary is of more importance. The range of errors in different models is greater than ordinarily supposed. He showed curves of variations of ratio and phase angle with load and power-factor in Fort Wayne and other meters. Transformers with a small range of errors should be selected, as a combination of errors might result in a bill 10 per cent too low. It pays to get the best.

John K. Himes, of Dayton, said that

in Detroit the meter and transformer are tested as a unit at long intervals, and the meter alone at shorter intervals. He favored full tests of secondary standards by some testing laboratory.

The proposed meter rules were discussed by L. C. Anderson, Weare Parsons, R. S. Graves, John K. Himes, F. C. Caldwell, H. B. Dates, George F. Snider and W. J. Rose.

Mr. Anderson, of Middletown, spoke from the standpoint of the small company and favored requiring secondary standards of utilities having over 1,000 meters, instead of 250 as proposed by the committee. An outside check is better for the smaller companies. In case of meters found more than 4 per cent fast, the refund should be computed from half of the consumption, instead of the total.

Mr. Graves, of Cincinnati, called attention to the objectionable rules adopted in other states.

Professor Dates, of Case School, said rotating standards should be checked every day against secondary standards, which should be maintained by every company having a separate meter department.

The effect of shipping meters after test was discussed by several, Mr. Parsons insisting that calibrations might be changed in transportation, and hence outside checking was useless.

Before the session adjourned, a telegram was read from Frank L. Tait, who regretted his inability to attend and sent wishes for a successful convention.

At the afternoon session an address was made by Beecher W. Waltermier, chairman of the Public Utilities Commission of Ohio. Mr. Waltermier sketched the development of American life to its present complexity and showed the dependence of the people upon the service of the public utilities, as well as the dependence of the latter upon the public. Both have a common interest, which can best be promoted by concord, not by discord.

Election of Officers.

The final session on Friday morning was called to order by President Hard, and the report of the Nominating Committee was presented by G. E. Miller. This report was adopted and the following officers elected for the ensuing year:

President, W. J. Rose, Alliance.

Vice-president, L. C. Anderson, Middletown.

Secretary-treasurer, D. L. Gaskill, Greenville.

Executive Committee: C. V. Hard, Wooster; F. J. Derge, Toledo; O. H. Hutchings, Dayton; Elam Fisher, Eaton; Robert Lindsay, Cleveland.

Advisory Committee: W. W. Freeman, Cincinnati; R. P. Stevens, Youngstown; E. A. Bechstein, Sandusky.

Finance Committee: D. J. Hard, Cleveland; T. O. Kennedy, Massillon; A. L. Thuma, Ironton.

Meter Committee: A. H. Bryant, Cleveland; George F. Snider, Toledo; Ray Wolford, Newark; John K. Himes, Dayton; Adrian Tobias, Youngstown.

Editorial Committee: D. L. Gaskill, Greenville; W. A. Wolls, Columbus; W. J. Rose, Alliance.

Illumination Committee: S. E. Doane, Cleveland; L. C. Anderson, Middletown; F. C. Caldwell, Columbus.

Transmission and Distribution Committee: M. H. Wagner, Dayton; S. M. Rust, Greenville; H. W. Hough, Cleveland; W. R. Power, Ironton; W. S. Smith, Tiffin.

New Business Co-operations Committee: J. E. North, Springfield; J. R. McCoy, Columbus; W. A. Wadsworth, Cincinnati; A. K. Young, Toledo; F. C. Morrison, Newark; H. B. Bixler, Akron; H. C. Gillie, Cleveland; W. E. Quillan, Alliance; F. B. Steele, Dayton.

W. J. Rose.
President, Ohio Electric Light Association.

Mr. Rose is general manager of the Alliance Gas & Power Company, Alliance, O., having occupied this position since 1908, when he left Cleveland. Last year he was president of the Alliance Board of Trade, and has been prominent in civic affairs. He was one of the founders of the Alliance Advertising Association and has been prominent in the Chamber of Commerce, upon whose Executive Committee he is now serving. Mr. Rose is also a director of the Alliance Country Club. He is a technical graduate of Columbia University.

Committee on Standardization of Voltages: S. E. Doane, Cleveland. W. C. Anderson, Canton; O. H. Hutchings, Dayton; E. H. Beil, Youngstown; H. L. Wallau, Cleveland.

Insurance Committee: L. K. Funkhouser, Dayton; F. C. Dunbar, Columbus; A. P. Martin, Cleveland.

Advertising Committee: T. F. Kelly, Dayton; W. E. Richards, Toledo; E. A. Bechstein, Sandusky; W. J. Rose, Alliance; R. H. Wright, Cleveland.

Station Operating Committee: Henry B. Dates, Cleveland; W. P. Hurd, Urbana; William Long, Toledo; Thomas B. Coughlin, Scranton, Pa.; N. G. Reinicker, Detroit, Mich.

L. K. Funkhouser then reported for the Auditing Committee that the accounts had been found correct. This report was adopted.

President-elect Rose was then called upon and voiced his appreciation of the honor conferred.

B. W. Waltermier, when called upon, recited an original poem, entitled "The Sons of Cain."

The report of the Committee on New-Business Co-operations was then presented by Thomas F. Kelly. This report detailed the meetings which had been held by the committee during the year, giving titles of papers presented and list of companies represented. It was recommended that a member of the next committee collect power data of installations in the state, and compile them in form for distribution, and a report be made upon them at the next convention. It was also recommended that meetings of this committee, the Meter Committee and the Transmission Committee be held on successive days in the same town, to accommodate those who would like to attend all. These meetings should be held in the smaller cities.

In opening the discussion Mr. Kelly pointed out that attention to power problems had predominated at the committee meetings. The attendance at these meetings totaled over 400. The Industrial Electric Heating Association was born at these meetings, and this subject will no doubt soon be a big factor in gross revenue.

J. E. North, of Springfield, emphasized the great interest which had been shown in the committee meetings. The paper on raw-water ice making had assisted the Springfield company to get a contract of this character. This also benefited the public, as the price of ice was reduced. He suggested that for the next year's work the committee be divided into three sections for the different classes of service.

F. B. Steele sent in a written communication favoring the collection of data by the committee. The smaller companies often have no trained power engineer and hence fail to secure business otherwise obtainable. His company has loaned an engineer for this purpose and he considered the practice advantageous to both companies.

C. I. Crippen, of Wheeling, W. Va., suggested that meetings of the committee be carried over into the evening, so that personal relationships could be improved around the dinner table while details were discussed informally. He favored the collection and tabulation of data, and knew of contracts which could have been closed if

the necessary information had been available.

O. B. Welch referred to raw-water ice and said there was no more excuse for a separate ice plant in a town than for an additional central station. Information for this process should be prepared beforehand, analysis of water made and trial cakes frozen. A change to this process in one plant had saved enough to pay interest on the entire investment.

Mr. Gilbert, a Detroit manufacturer of ice-making machinery, said that merchantable raw-water ice can be made from any water supply except the alkaline water of Texas and Oklahoma. He had many data on electrically driven plants, which were available to the central stations. An ice plant is a very desirable load. The plants installed in Detroit had increased the central-station revenue by $65,000.

A. K. Young, F. H. Stambaugh, D. L. Gaskill, S. F. Messer and Weare Parsons also joined in the discussion.

H. O. Loebell then gave a talk on "Industrial Electric Heating" with special reference to the work accomplished in Toledo, where a load of 20,000 kilowatts has been connected, representing a consumption of 7,500,000 kilowatt-hours per month, with a good load-factor. In this field it is necessary to first study present methods and find how much heat is wasted. The efficiency usually depends upon the temperature at which the operation must take place. If this temperature is high, most of the heat developed by fuel will go up the flue. In low-temperature operations extra air is usually introduced, which also wastes heat. Strong points for electric heating are the ease of regulation, cleanliness and convenience. In considering a prospect of this kind, an analysis should be made of the load, the cost and the effect on the power station. Suitable apparatus must be developed and a rate made which will hold the business. If the load is not permanent, its acquisition will be a detriment. In the Overland plant at Toledo enameling ovens are in operation in sizes 7 by 8 by 10 feet up to 20 by 40 by 8 feet. The standard heating unit is operated on a 440-volt circuit and has a capacity of 10 kilowatts. The cost is greater than for heating with fuel, but the advantage is a greater and more uniform output. Spoiled material is greatly reduced on account of the close temperature control and comparatively low temperature of the source.

The report of the Electric Vehicle Committee was then presented by C. H. Chappelle. This committee has been working up information which will soon be distributed. Improvement in details of vehicles and storage batteries is noted, as well as progress in standardization. The small industrial truck represents a promising field.

The discussion was opened by George D. Smith, of the General Vehicle Company, who pointed out that the experimental stage was past, and the manufacturer now knows what to recommend for any specific service. Certain parts of the country have special requirements, and the vehicle must be adapted to the work. Only four per cent of the central stations in the country are operating electric trucks. More trouble has been experienced in adapting trucks to the needs of utility companies than in any other service. Their requirements are varied and usually they do not know what they need, nor use the trucks merely for the purpose ordered. Examples were given of the abuse of trucks in central-station service and of savings in expense where used to advantage.

Mr. Drake's discussion will be given in greater detail in a subsequent issue.

F. B. Neely, of the Electric Storage Battery Company, explained the construction of the plates now used in Ironclad Exide batteries. One such battery has reached an age of 51 months in service.

D. L. Gaskill advocated co-operation in the work of the New-Business and Vehicle Committees.

L. T. Block, manager of the Utilities Indemnity Exchange, explained the activities of the concern in respect to liability and fire insurance.

The meeting passed a vote of thanks to Colonel Hard and a motion endorsing Electrical Prosperity Week and at noon the convention adjourned.

Kentucky Mines to Operate Electrically.

Definite developments are noted in the project to establish a large central power station at Hazard, Ky., to supply power to the mining operations in that section within a radius of 25 miles. Edward O'Toole and Howard N. Eavenson, of Gary, W. Va., well known coal and power operators, and Baltimore interests are financing the project, which, it is stated, will cost more than $250,000. The power plant of the East Tennessee Coal Company has been taken over, an additional unit will be installed, and the plant operated temporarily to supply the development needs, while the permanent station is being constructed. R. D. Baker, of Hazard, connected with the Kentucky River Power Company, is also interested in the project, and stated in Lexington that the central station would be in operaion inside of 90 days. It is said that numbers of the coal mine operating companies, which have secured their leases from the Kentucky River Coal Corporation, a new coal combine, have contracted for service. At Hazard, R. L. Cornell is in charge of the project, though it is stated that Mr. Baker will supervise the actual construction.

A reinforced concrete central plant is the permanent improvement in progress, to house a turbo-generator unit, running condensing, with automatic stokers and ash-handling equipment, etc. A transmission line is to be built through the heart of the mining country from Hazard to First Creek, to be carried on 40-foot white chestnut posts with galvanized cross-arms.

Effective Resistance and Inductance of Iron and Bimetallic Wire.

When a direct current flows in a wire, the distribution of the current is uniform over the cross-section of the conductor. When, however, an alternating current flows in a wire there is a tendency for the current to crowd to the outside. This phenomenon becomes more pronounced the greater the number of alternations of the current in a given time and, in iron wires the greater the current in the wire. In some cases the flow of current is confined almost entirely to a thin shell on the outside of the wire and hence arises the term "skin effect" for this phenomenon. The effective resistance of the conductor increases as the frequency of the alternations increases and at the same time the inductance, which depends upon the magnetic field, is diminished.

When the conductor is of simple form and the magnetic permeability of the material is known, the effective resistance and inductance can be calculated. The investigation, the results of which have been published by the Bureau of Standards, in Scientific Paper No. 252, was concerned with the skin effect in conductors containing iron. Two classes of conductors were considered in particular: the iron telegraph and telephone wires and copper-clad bimetallic wires. The latter have a core of steel surrounded by a shell of copper. The effective resistances and inductances of these conductors were determined experimentally for different strengths of current and for frequencies up to 3,000 alternations per second. The results for iron wires obtained with very small currents were compared with values computed by known formulas.

Formulas are developed in this paper which permit a similar comparison between measured and computed values for the copper-clad wires. The paper concludes with wire tables computed by means of the new formulas.

THE THREE MOST IMPORTANT PRICE-FIXING CASES NOW BEFORE THE PUBLIC—THE FORD, VICTOR AND KELLOGG CASES.

By Elton J. Buckley.[1]

I have just been reading in the United States Court reports the first intelligent information I have had as yet as to the real gist of the court's decisions in the three recent celebrated price-fixing cases—the Ford automobile case, the Kellogg corn-flake case and the Victor talking-machine case. In all these cases the manufacturers tried with the utmost ingenuity to tie up both jobbers and retailers so that the wholesale and retail prices on their various products would not be cut. The United States Court decided against all of them. In the Kellogg case the decision was not final or complete, but indicates the mind of the court on the main question whether a manufacturer may compel a retailer, whom he has not sold direct, to sell at a price which the manufacturer dictates.

Some attention was paid to these three cases by the newspapers, but as usual, the reports were badly garbled, and in order that the business world, which is so keenly interested in the subject from one standpoint or the other, should have a clear conception of the progress of legal events, I will briefly give the point involved in each of the three cases.

The Ford Case.

The Ford Motor Company has always tied everybody up to sell Ford cars at retail at regular list prices. One of its agents or sellers in Ohio cut the price and Ford at once asked for an injunction and damages. The Ford plan of limiting the price was to do what is called licensing its dealers, the condition of the license being that they should resell at regular Ford prices. Of course Ford's idea was that if anybody violated that condition and cut the price, he would revoke the license to sell and get an injunction preventing the cutter from selling any more cars that he might have on hand.

The plan did not succeed. The court held that in spite of the "licensing" scheme, Ford had actually parted with the title to his cars, and the buyer therefore had the right to do as he pleased with them. The court said it was true Ford had made a contract with his dealers not to cut the price, but it was illegal and he could not enforce it. This case enforces the doctrine laid down by the United States Supreme Court in the Sanatogen limited-price case, that whether an article is patented or not, a seller who has actually sold it, and parted both with possession and title, can not interfere with the retail selling price.

The Victor Talking-Machine Case.

The scheme used in this case was even more ingenious than the other. The Victor concern has of course patented its machines and its records. Everything, in fact, about its whole enterprise is tied up with patents. Every machine and every record had printed on it a notice that they were not sold, but that the Victor Company merely licensed the right to use them. The title to both machine and records remained in the Victor Company until the patents expired, according to this clever scheme. Here, too, this "license" could be revoked the minute somebody—buyer or licensee, whichever you like—broke the Victor Company's rules, the most important of which was of course the rule to sell at a fixed price. And if the price was cut the Victor Company, under its contract, could go in and take its goods back.

The "license to use" was granted upon the payment to the Victor Company in the beginning of a sum which the Victor Company called a "royalty," but which corresponded exactly with the price charged both for machine and records.

Macy & Company, the New York department storekeepers, cut the price of Victor records, and the Victor Company promptly revoked their license to sell and demanded the return of all unsold goods on the ground that breaking the price condition constituted an infringement of its patents! Macy & Company resisted, and the Victor Company then applied for an injunction, damages, etc., to prevent Macy & Company from continuing to cut prices. Here, too, the plan failed. The court said that inasmuch as the Victor Company had collected the whole royalty in the beginning, instead of in installments like royalties are usually collected, it showed that it was after all not a license, but a sale, and being a sale, the Victor Company could not interfere with the retail selling price.

The Kellogg Case.

The Kellogg Company is a manufacturer of toasted corn flakes and has always been particularly earnest in its effort to compel jobbers to sell retailers at a uniform price, and retailers to sell consumers at a uniform price. Its latest plan was to get a patent on some feature of the carton in which its corn flakes were packed. It could not patent the corn flakes. The company only sells jobbers that will agree to sell to retailers at the company's fixed price. It did not deal with retailers direct, so it printed a notice on each carton that the retailer who sold below 10 cents would be considered an infringer on the company's patents. Here the question was opened by the United States Government, who began suit against the Kellogg Company on the ground that its plan of limiting prices was a violation of the Sherman act. The first decision on this case has just been handed down. Although only on a part of the case, it is significant in that it declares that the fact that the carton is patented is immaterial in determining whether the company's plan of maintaining prices is a violation of law.

From these three cases, which are the latest and the most important at the moment before the public, the crux of the limited-price campaign may easily be seen. The manufacturer who wishes to enforce a fixed selling price is trying by every possible means to hold on to his goods until they get into the consumer's hands. That is, not hold actual physical possession, but hold the title. The reason is of course clear. As long as he holds the title, the goods are his to do as he pleases with, including fixing and holding the price at which they shall be sold. To reach this result the manufacturers license and patent and make agreements, but the trouble with all of their plans is that they want the cake and the penny too. They want to sell and not to sell. They want to collect the purchase price of their products and still say it is not a sale. The United States Supreme Court and several lesser United States Courts have repeatedly said, in the last few years, that this cannot be done. If the transaction is really a sale, no matter what it is called, the manufacturer is helpless to control the selling price in the hands of anybody who has acquired both title and possession.

There is only one way for a manufacturer to do what he wishes to do, and that is to actually hold title to his goods until they are sold to the consumer. He can do that by regarding retailers as his agents and actually—not by a legal fiction, but literally—consigning his goods to these agents, taking his pay only when they are sold. If he is willing to do that he can control the selling price clean to the limit, but he has not been willing to do it up to this time, owing to the enormous trouble and work which it involves.

Oklahoma produced 3,988,613 short tons of coal in 1914, valued at $8,204,015. This was a decrease of 4.25 per cent in quantity and 3.97 per cent in value from the production of 1913, and was due to the displacement of coal by petroleum and gas as fuel.

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ANNUAL CONVENTION OF ELECTRICAL CONTRACTORS.

National Association Meeting at San Francisco Preceded by Meeting of California Association.

The fifteen annual convention of the National Electrical Contractors' Assotion of the United States was held at San Francisco, Cal., July 21 to 24. Headquarters were at the Clift Hotel. A special train bringing delegates from the East arrived at ten o'clock on Sunday morning, July 18. July 19 and 20 were devoted to a meeting of the California Association, a report of which follows:

The sixth annual meeting of the California Association of Electrical Contractors and Dealers was held in San Francisco, with headquarters at the Clift Hotel, July 19 and 20. An executive meeting was held Monday morning at 9:30 o'clock. At 12:15 luncheon was served at the Hof Brau Cafe. A regular meeting was scheduled at 2 p. m. at the Civic Auditorium. President C. V. Schneider presided and W. S. Hanbridge was secretary. The secretary reported the association has 16 new members added during the year and had held seven monthly meetings. Reports, including auditor's and financial report were approved and found satisfactory.

The reports of the vice-presidents of the different districts followed. L. R. Boynton, for San Francisco district, said a hard problem is being faced to bring around a better understanding, which would be to the advantage of every one concerned. L. Giltin reported for the Oakland district, saying Oakland has had good meetings and well attended. We have eliminated a good deal of evil by attending these meetings of jobbers and contractors. F. Somers, of San Jose district, said it is better to have the good will of our customers than the bad, and power companies would help us in our district; co-operation pays because it pays to say "I am a member." C. Lovebay, Santa Barbara, says the interest is rather low in his district. It was then voted that the acts of the Executive Committee be approved.

Albert Elliott, attorney of San Francisco, then addressed the convention on his favorite topic, "Co-operation between central stations and contractors." There is a distinction between self interest and selfishness. A self interest will always be first, but the question is: "Will you eliminate your selfish and narrow horizon?" Self interest is broad and has a wide horizon. Selfishness says: "The more business I can get the better off I am. I am the gainer." One grabs from the other and thinks this is business and fights on a price-cutting basis. Now about self interest. He does not grab business but the way to do it is to go out and make *new business.* Be not selfish. You have got to see that one is selfish because of ignorance. Self interest is much better. Educate yourself as a bidder, to make a reasonable profit. Education is the true co-operation. It is the soundest of all business propositions, so this education along these lines of co-operation must be good for the electrical business.

After Mr. Elliott's talk a discussion on "Estimates" was indulged in by several members.

Then followed the annual election of officers, with the following result:

President, C. V. Schneider, Sacramento.

Vice-presidents, L. Boynton, San Francisco; F. Nagle, Oakland; Frank Somers, San Jose; C. Lovebay, Santa Barbara; H. C. Reid, San Francisco; N. D. Powell, Stockton.

Secretary-treasurer, W. S. Hanbridge, San Francisco.

Mr. Schneider acknowledged with words of appreciation his election for the third time.

The dinner and regular monthly meeting of the California Association of Contractors and Dealers was held Tuesday evening, July 20, at Clift Hotel. Mr. Schneider, presiding, introduced first Mr. Hope, who read a paper prepared by a Joint Committee on Co-operation, whose principles had been adopted as the recognized principles of the California Association. Following this, Mr. Hillis and Mr. Berry made short addresses.

Stanley Walton, of the Pacific Gas and Electric Company, followed, saying that co-operation is coming for all interested. Lack of co-operation is a great drawback, but now there is a fairly good understanding. This condition has been brought about by a few men and to bring about this has always been hard work. In this understanding the Pacific Gas and Electric Company will make good on its side.

The chief speaker of the evening, W. L. Goodwin, vice-president and general sales manager of the Pacific States Electric Company, made a lengthy address which was closely listened to and received with applause, he dealing chiefly with the principle of co-operation.

J. R. Galloway, president of the National Electrical Contractors' Association, was introduced and said: "I want to express the great joy I have in being here. It is a privilege and an honor. Co-operation is a good rule to go by. I am much impressed with your individual ideas. You have made a practical demonstration of co-operation here. You teach us a great lesson. I extend my thanks and the East will reciprocate your welcome in the future."

Left Half of Group of Electrical Contractors at San Francisco Convention, July 21-24.

W. S. Hanbridge, after a few appropriate remarks, presented Mr. Galloway with an album of views as a closing feature.

On Tuesday, July 20, a meeting of the National Directors and Executive Committee was held at the hotel. On Wednesday, July 21, at ten o'clock, at the Civic Auditorium, was held an open session of the National Association. The address of welcome was made by E. F. Butte, president of the San Francisco Association. With a complimentary allusion he introduced James Rolph, Jr., mayor of San Francisco, who made a fine address to the assembled delegates, saying in part: "You are welcome to San Francisco and honor us by visiting our city. In my short life I have seen the electrical industry grow to one of the largest."

Mayor Rolph was followed by C. V. Schneider, president of the California Association, in a few remarks. The reply to Mayor Rolph's welcome was made by John R. Galloway, president of the National Electrical Contractors'

Association, saying it gave him great pleasure to meet so many electrical men and especially glad to see Western members who are alive to Association work and show interest by their presence. He could make no adequate reply for the warm expression of good fellowship. The electrical men have added to the service and luster of the exposition.

After this, Mr. Galloway presiding, followed an illustrated lecture with lantern slides by G. C. Holberton, of the Pacific Gas & Electric Company. Prefacing the exhibition of the pictures, Mr. Holberton said that in hydroelectric lines the Pacific Gas and Electric Company has invested $300,000,000. It pays out $12,500,000 annually, serving a territory of 40,000 square miles. Several hundred slides were exhibited to show the industrial development.

C. C. Moore, director-general of the Panama-Pacific International Exposition, being unable to be present, was represented by O. H. Cowell, who said: "The exposition is a celebration of American genius of this age, and it is our purpose to make this exposition for our own day, and therefore we desire the methods of modern progress, and therefore we are pleased to have you here as an integral part of this exposition, and although the exposition will decay the spirit of this convention will remain. Your convention is one of the epochs of the period and your work is valuable for human service. We believe you work for human betterment and your meeting will be an inspiration to you and to us."

James R. Strong, of New York City, gave a short talk on the objects of the Society for Electrical Development. The Society is developing and succeeding; its theory is really practical co-operation. He also spoke of Electrical Prosperity Week.

T. C. Bliven, general manager of the General Electric Company, then addressed the convention. Mr. Bliven reviewed briefly the history of the electrical business. Edison, Brush and others had to market their products at the start, and after a time turned this over to the contractors; then the manufacturer had his hand in the business, but manufacturers found that the contractor could do the business better. The contractor has made great progress. He then spoke of the province of the manufacturer, jobber, contractor and central station, all interdependent, and their work should be done with profit to each other. Cooperation does not mean lack of competition. We should cease criticism of each other; forget our differences, and help the one who is trying to help himself. We should strive to bring about this spirit of toleration, for it is the best for all of us.

At the Executive Committee meeting on Thursday, July 22, P. H. Jaehnig, chairman of Legislative Committee, spoke of the good done by the issue of 6,000 copies of his report, which have been distributed free to many cities.

G. M. Sanborn, of Indianapolis, reported on the Uniform Data and Sales Book. The distribution of this book will also be continued. V. C. Gilpin, of Brooklyn, N. Y., master of transportation, spoke commendatory words of praise for their reception in state and city.

J. R. Strong expressed his appreciation of the reception by Californians.

J. F. Maron reported for the Membership Committee.

P. H. Jaehnig presented a report urging all employees to avail themselves of the benefits of liability insurance.

The final business session was held at ten o'clock on Friday, July 23. At this meeting New Orleans was selected for the convention of 1917. The officers for the ensuing year were elected as follows:

President, John R. Galloway, Washington, D. C.

First vice-president, W. L. Hutchinson, Kansas City, Mo.

Second vice-president, J. C. Rendler, Los Angeles, Cal.

Third vice-president, J. S. Musser, Harrisburg, Pa.

Treasurer, James H. Hilton, Syracuse, N. Y.

Secretary, George H. Duffield, Utica, N. Y.

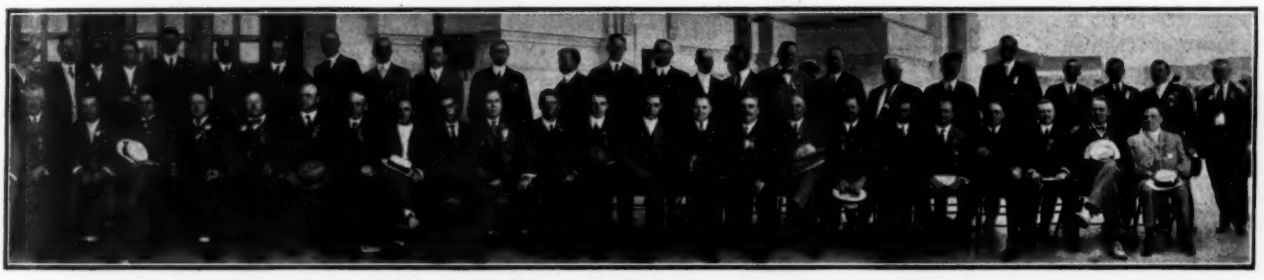
Sergeant-at-arms, James F. Burns, Schenectady, N. Y.

According to a change in constitution and by-laws, national directors can be voted for only by members of the National Association. State members have no vote. One-cent letter postage was endorsed by the Executive Committee, as well as by the convention.

Robley Stearnes, who is the personal representative of Governor Hall, of Louisiana, and officials of that state, spoke words of appreciation for the convention going to New Orleans in 1917. It was voted to have the annual meeting not in July, but the third Wednesday in October.

Ernest McCleary spoke on the Code, 99 changes in which occurred in March. The Bureau of Standards, at Washington, has undertaken a new code of safety rules; these rules will be made up by well informed men. The National Association has played its part well in the building of the Code.

A paper was read on liability insurance; it was strongly recommended to members and through committee efforts the cost has been reduced one-half. The association adopted a resolution to take up this subject amongst its members. This reduction in rates is practically in effect in three states now.



Group of Electrical Contractors at San Francisco Convention—Right Half.

An interesting feature of the convention was the fact that eight of the original fifteen charter members at Buffalo were present at this meeting.

On Saturday, July 24, through the courtesy of J. J. Carty, chief electrical engineer of the American Telephone & Telegraph Company, the members enjoyed the unique experience of a long-distance talk between San Francisco and New York at the booth of the company on the exposition grounds.

Entertainment Features.

On Monday, July 19, a tea was given at the Fairmont Hotel. On Tuesday, July 20, the ladies were entertained with a luncheon at Tait's. At 7:30 p. m. a trip was made through Chinatown. On Wednesday, July 21, there was a card party for ladies at the Clift Hotel. In the evening a reception and dance for all was held in the main dining room of the Clift. On Thursday, July 22, there was an auto ride for ladies and guests through the Presidio and Golden Gate Park, tea

being served at the Japanese Gardens in the park. In the evening was held the National Electrical Contractors' Association night at the Zone. The party left the Clift Hotel on special cars at eight o'clock. Various places were visited and the fun was fast and furious. On Friday a ladies' auto ride took place through Oakland. On Friday evening there was a dinner-dance and vaudeville at Hales Pompeiian Court. On Saturday, July 24, the members and ladies gathered at the Clay Street wharf for a trip around San Francisco Bay. They landed at the exposition grounds at 2:15 p. m., where President Galloway was presented the official plaque of the exposition. There was a large committee on entertainment which did its work in a very satisfactory manner.

The next annual convention will be held in New York City.

Demonstration of Electrical Appliances by Tasmanian Hydroelectric System.

Arrangements are being made by the Hydroelectric Department of the Government of Tasmania to hold a practical demonstration of the economy and convenience of cooking, heating, and lighting by electricity. This demonstration will be given during October in the new auditorium at Hobart, Tasmania, and every effort will be made to arouse the interest of the people, to whom admission will be free.

The object is to increase the uses of electricity by giving the people an opportunity of seeing the various uses to which it can be applied. As electricity will be much cheaper when the Government hydroelectric plant is completed, this demonstration is very opportune, as it will show many new ways in which electric power can be utilized.

The Government is asking local firms who carry electrical appliances to cooperate in this work by furnishing the various appliances for the demonstrations. As this will be a great advertisement for such dealers, there is no doubt as to their participation.

Likewise, this will be a unique opportunity for manufacturers to bring their goods to the notice of the buying public, and while without doubt many American electrical appliances will be displayed by local dealers, yet some additional displays by American manufacturers would prove to be of exceptional publicity value, and also would bring our goods prominently to the notice of the buying public at a time when the demand for such goods will be on the increase. The demonstration is in charge of Mr. Butters, engineer in chief of the Hydroelectric Works, Hobart, Tasmania.

ELECTRIC WELDING.—III.

By Gordon Fox.

Miscellaneous Welding and Associated Processes.

One of the most common electric welding processes is "spot welding." Spot welding, as its name indicates, is the method of joining together metal sheets or plates by welded spots serving the same purpose as rivets. Machines for spot welding comprise the same essential parts as machines for butt welding, but they differ materially in shape, because of the different nature of the work and different character of stock handled. A spot-welding machine includes a transformer for reducing alternating-current power to 1 to 3 volts in pressure; a switch for connecting and disconnecting the circuit; means for regulating the voltage; and means for applying pressure. In these respects butt welders and spot welders are similar. In spot welding the article is not clamped as for butt welding. Pointed copper electrodes, properly shaped to suit each class of work, introduce the current. The operator places the lapped stock between these copper die points and brings the points against the stock by means of a hand lever. He then connects the electric power, causing a heavy flow of current from one die point, through the metal to the other die point. The resistance of the stock causes local heating under the die points. When welding temperature is reached the dies are squeezed more firmly, the plastic metal is forced together and sets, causing a union of the two sheets over a circular area of approximately one-fourth inch diameter. The pressure is relieved, the die points opened, the stock moved to a new position and the operation repeated.

The field for spot welding is very broad. Almost any sheet-metal job where riveting is done on quantities of duplicate parts, can be handled to better advantage by spot welding. The variety of applications can best be shown by enumerating some products utilizing the process in the course of manufacture. Kitchen ware affords many illustrations; handles are welded upon coal hods, waste cans, pails, pans, cups and many similar articles. Elevator buckets, oil cans, letter boxes and stove pipe are a few small articles utilizing the method. Among the larger products are: Stoves, filing cabinets, refrigerator linings, automobile tonneaus, metal culvert, sleds and runners. Spot welding is used extensively in the manufacture of steel railway cars, particularly for the interior work and trim. Fig. 17 shows several other spot-welded products.

Nearly all the metals can be successfully spot welded. Sheet iron and sheet steel are the materials most commonly used, and are very easy to weld. Galvanized iron can be welded, although it will burn off the zinc at the spot where the weld is made. No. 28 gauge galvanized iron is about the lightest weight that can be successfully welded, since, with the lighter weights, there is insufficient stock under the zinc. Tin can be welded to tin or to sheet iron. A discoloration occurs at the weld, however. Sheet brass and bronze can be welded to sheet brass or to sheet steel. German silver, zinc, nickel and many alloys can be successfully welded. Sheet aluminum can be spot welded, but the surface is left slightly roughened under the die points. It is rather difficult to weld sheet copper, due to its low electrical resistance, but it can be done.

Spot welding is essentially a sheet-metal process. It is necessary to have

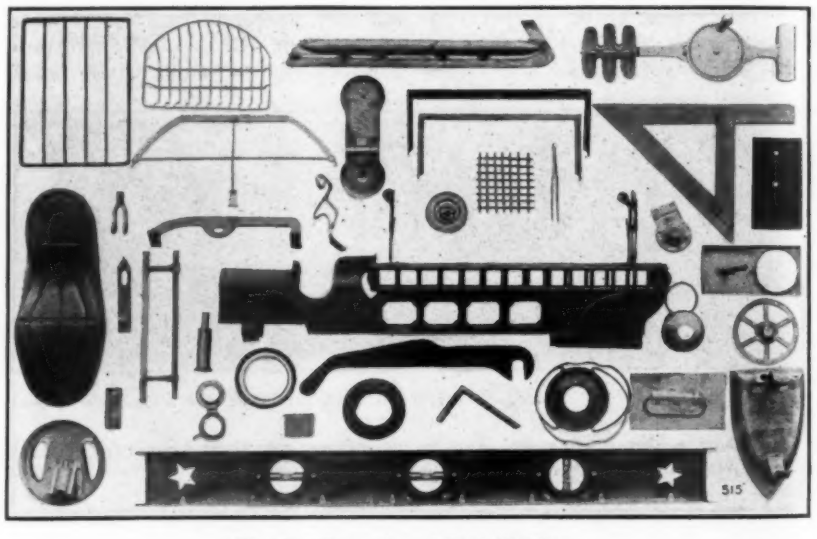


Fig. 17.—Examples of Spot Welding.

the two pieces of metal touch each other at the point where the weld is to be made. If the stock is very heavy slight buckles or depressions in the surfaces will prevent good, concentrated contact, the pressure of the dies being insufficient to force the heavy stock into intimate contact under their points. It is, therefore, difficult to weld heavy-gauge sheets, except in large, special machines. Light gauges of metal can be easily welded to heavier gauges, or

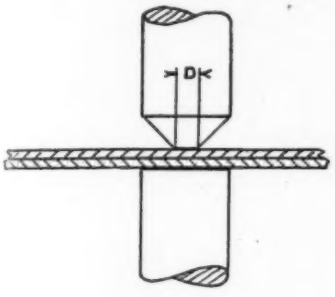


Fig. 18.

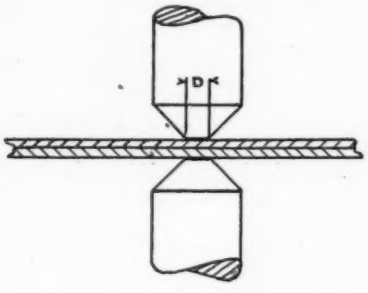


Fig. 19.

even to solid pieces, the single die forcing the light-gauge metal into proper, concentrated contact. Another difficulty arising when it is endeavored to weld heavy stock, is the fact that when enough current is conducted through the copper die points to heat heavy sheets the copper points themselves tend to soften and wear more rapidly.

It is necessary that the die points be properly proportioned and maintained to insure good results in spot-welding work. The shape and size of the die points is important. Tables II and III show the proper dimensions for

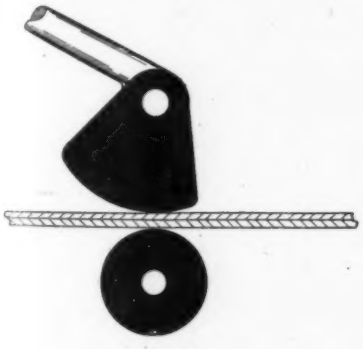


Fig. 20.

the dies for different weights of metal, the shape of the dies being shown in Figs. 18 and 19. When it is desired to secure a smooth surface upon one side of the welded article that side is placed upon the flat die. There will then be a slight depression upon the reverse side. When welding galvanized iron it is imperative that both dies be pointed to prevent an accumulation of zinc and consequent roughened die points.

Spot welding is a process which competes with riveting, double seaming, flame welding, brazing or soldering, according to the nature of the work. It is superior to all these manufacturing processes in strength and cost of production. Spot welds can be made very rapidly, as many as 1,000 welds per hour being not unusual on plain work. One man cannot approach this number of inserted rivets in an equal time, aside from piercing the necessary holes and furnishing the rivets. In appearance of the job the spot weld excels, because it leaves a smooth, flush surface. A rivet requires a head, seaming is unsightly and flame welds or soldering leave a fin, which must be removed. Spot welds are not affected by temperature, hence will hold tight joints, whereas rivets expand and loosen under heat.

The energy required for spot welding is not great. Considerable power is involved in each weld, but the duration is so short that the resulting consumption of energy is low. Table IV gives a basis for calculating the power cost for spot welds of clean sheet steel. The table also shows the time that the power is applied. The number of welds per hour depends upon this figure in conjunction with the rate at which the machine can be fed. The rate of feed depends largely upon the particular article.

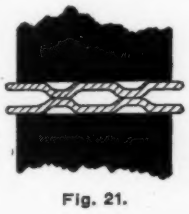


Fig. 21.

TABLE II.—SIZE OF POINT IN FIG. 18 FOR IRON OR STEEL.

Gauge No.	Diameter D in Inches
28	0.125
26	0.125
24	0.125
22	0.125
20	0.188
18	0.188
16	0.188
14	0.25
12	0.25

TABLE III.—SIZE OF POINT IN FIG. 19.

Iron or Steel. Gauge No.	Diameter D in Inches
10	0.25
9	0.31
8	0.31
7	0.31
6	0.38
5	0.38
4	0.38
3	0.44
2	0.44
1	0.44
0	0.44
Galvanized Iron.	
Gauge No.	**Diameter D in Inches**
22	0.125
20	0.125
18	0.188
16	0.188
14	0.188
12	0.250
10	0.250
9	0.375
8	0.375
7	0.375

TABLE IV.—SPOT-WELDING DATA.

No. of Steel	Kilowatts Required	Seconds per weld	Power Cost per 1,000 Welds at 1 cent per Kilowatt-Hour
28	5	0.3	$0.004
24	7	0.5	0.01
20	9	0.7	0.018
18	10	0.8	0.022
16	12	0.9	0.030
14	14	1.0	0.039
12	16	1.3	0.058
10	18	1.5	0.075
8	23	2.5	0.16
6	28	4.0	0.31
4	33	6.0	0.55

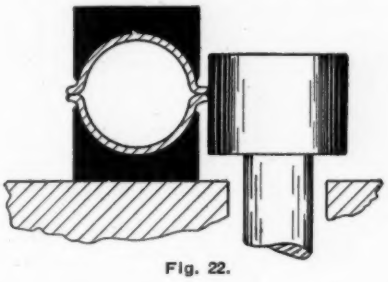


Fig. 22.

The highly intermittent spot-welding load is not particularly desirable for central-station lines. It has been claimed that in many cases the duration of the peak is so short that integrating meters fail to record the entire energy consumed, due to their retarded action. Special rates are, therefore, sometimes arranged for spot-welding service.

Fig. 23.—Portable Welding Outfit.

The cost of spot welding is almost entirely labor cost. The cost of power is usually less than the cost of rivets. No greater skill is required for spot welding than is needed for riveting. A man can produce several times as many

spot welds in a given time as he can insert rivets, hence, from a cost viewpoint, the welding is to be preferred.

The strength of spot welds is excellent. It is possible by spacing the welds fairly close to weld two sheet-steel strips so that the weld is stronger than the strip itself. Tests on strips both welded and riveted have invariably shown failure at the riveted joint first. Moreover, the spot weld, being a union of the metal, is less subject to corrosion than a rivet joint having interstices to retain moisture.

An interesting and rather new development of electric welding similar to spot welding, is now employed in manufacturing handles, casters, pulley sheaves and similar products where the article can be readily stamped in two halves, the two pieces being welded together. Bosses are punched upon the stampings so that, when assembled, they form points or lines of contact along which the welding current is concentrated. The procedure is the same as in spot welding, the result being a weld between the two parts, along the bosses. Fig. 21 shows the method of welding pulley sheaves. Automatic machines are now built which perform this operation at considerable speed.

Another welding method coming into vogue is termed "seamless" welding, the purpose generally being to make a continuous weld in place of a seam. One method of seam welding employs roll electrodes to replace the die points used in spot welding. The lower electrode is a roll, the upper either a roll or a sector of a circle. The same principles apply here as in spot welding, except that a continuous seam results instead of a spot. For this work it is necessary to use only pickled stock, so that the roll may be assured intimate contact. See Fig. 20.

Another method of seam welding is illustrated in Fig. 22. Here one electrode is a roll mounted upon a vertical axis. The other side of the circuit is connected to the top surface plate of the welding machine. The work to be welded is clamped between blocks and the seam projections brought into contact with the slowly revolving center roll. These projections are thus heated and pressed into the work so that a seamless weld results. A notable example of this style of welding is a teakettle spout.

There are a number of cases where welds of light wire or ribbon stock are desired. A portable equipment for such service is illustrated in Fig. 23. A pincer-shaped clamping device is provided, which suffices to grip the ends to be joined, switch on the current, produce the thrust and disconnect the current, all automatically.

Aside from welding proper, electric heating methods of similar character are now used in a number of manufacturing processes. In the annealing of armor plate and machine tools preparatory to drilling or machining operations the same principles are involved. To anneal a section the electrodes of a low-voltage transformer are brought into contact with the pláte, the current is switched on and increased until the desired heat is obtained, after which it is gradually reduced to zero. If the current were discontinued suddenly, rehardening of the annealed spot would be probable.

Electric heating is now resorted to in some cases for preheating, as in heating tubing uniformly over a given section previous to bending. If a bar of steel be placed between the clamps of a butt welder and heated and subjected to axial pressure, a considerable upset may be made in that portion between the jaws. If swaging blocks are now brought into play the upset may be formed into desired shape while hot.

The electric heating method is excellent in connection with brazing work. The article is clamped in the jaws of a butt welder, the current turned on and regulated until the desired temperature is attained, after which the spelter flux is applied. The heat is under perfect control with the stock in full view. The method is also superior to heating with torches, because a torch always burns out some of the zinc from the spelter and oxidizes the copper.

Hardening and tempering of steel can be easily and effectively done by clamping the stock in suitable dies of the butt welder, bringing it up to the proper temperature to produce the desired color and cooling in the usual manner. Since the metal is in plain sight of the operator and the heat is under perfect control, this method is ideal for work adapted to clamping.

Riveting and heading of rivets can be done in a machine having the same general characteristics as a welder. A cold rivet can be inserted into its hole and the two electrodes brought against the two ends of the rivet. When the current is applied the rivet is instantly heated, pressure being exerted to cause the upset and to form the head. This method has a number of points of superiority.

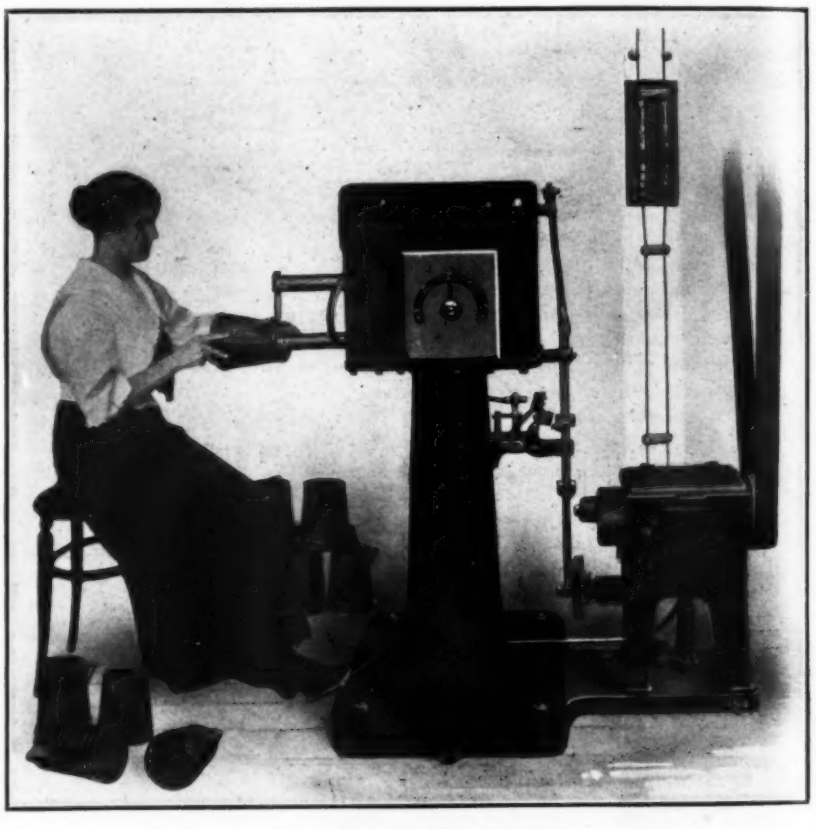


Fig. 24.—Spot-Welding Machine.

It has been attempted to set forth briefly the many applications of electric welding, and to explain the principles and methods involved. There is hardly an industtry which cannot derive benefit from the utilization of one or more of the electric welding or heating processes. In the foundry, locomotive shop and repair shop the arc welding processes are particularly useful. The automobile industry employs butt welding extensively, and many others of similar characteristics could well adopt it. The sheet-metal industries find spot welding a boon.

Vail Celebrates Seventieth Birthday—A Long-Distance Interview.

The New York *Times* publishes a very interesting account of a long-distance interview with Theodore N. Vail, president of the American Telephone & Telegraph Company, on the occasion of his seventieth birthday, Saturday, July 14. The story follows:

"On his estate, Speedwell Farms, Lyndonville, up near the Canadian line in Vermont, Theodore Newton Vail, president of the American Telephone & Telegraph Company, celebrated his seventieth birthday yesterday. There were thirty guests in a house party at Speedwell Farms, and Mr. Vail spent most of the afternoon driving with them. He found time, however, to read 300 letters and telegrams of congratulation and to answer many of them. He also received over the long-distance telephone the felicitations of his friends in San Francisco and other cities in the South and West. Over 550 miles of wire from New York, Mr. Vail received the congratulations of the New York *Times* and gracefully submitted to an interview on matters of great public interest.

"'I thank the *Times* for its well wishes," said Mr. Vail in a strong, clear voice over the telephone. 'I am 70, and I am having one of the happiest birthdays of my life. I had a very pleasant drive this afternoon, and I have been receiving the kind wishes of my friends. Seventy years? Well, I never felt better.

"'I have had several hobbies in my life, but just now my hobby is getting the best out of life. Do I contemplate giving up active business life? I can't. They won't let me. It is not a question of choice. Naturally if I consulted my own feelings entirely I would like to drop the harness. "Like" is hardly the word, for I do not mean I would like to give up work as long as I can do good.

Chances for Young Men.

"'There are still chances for doing well. Look around at the yong men of today. Their chances were never so big as they are now. In electrical science we have not yet begun to find out the capabilities for development.

"'The opportunities are still wonderful, and we shall continue to progress in adapting electricity to the service of man. There is much to be done, and I expect to do some of it. I have talked to San Francisco today, and I am now being interviewed over 550 miles of wire. This is an index of what has been done, and is also a hint to those who have faith of what can be done in the future. I believe electricity is going to be adapted more and more to our daily service. All we have done is but a beginning.

"'I do not predict any sudden discoveries. Electrical progress will not be an outbreak, but an evolution. The things we do now we are going to do better and more quickly. Ten years or more ago an interview like this would have been impossible. Now it occasions no surprise. The telephone illustrates what I mean by evolution. This ability to talk over great distance has been developed mile by mile, not by jumps of 200 to 500 miles, but in 10-mile stretches. We work on, bit by bit, to the perfect accomplishment.'

"'Have you in mind any improvements in telephonic communication?' Mr. Vail was asked.

"'No,' he replied, 'we never tell what work we are doing until we have made an improvement complete, ready for public use.'"

"Pull" No Longer Effective.

"Returning to the subject of the chances of success for young men, Mr. Vail said that while opportunities had increased, the time had also come when only merit in business life would win success. 'Father's sons' and 'somebody's relatives' can only make good by work and ability.

"'The young man who is willing to work and has ability and a good education, is the one who is going ahead,' continued Mr. Vail. 'There was a time when, because a person was the son of an old friend or had influence, he would be given a good position and boosted along. That day is past. Too much is involved in big business to have its affairs retarded because of a friendship. It has been discovered that one cannot run a business under the present high pressure by favoritism or nepotism. I don't mean that young men with friends are not given chances, but I say they have to make good or get out. Opportunities? Why, sir, the world is still full of them.'

"Mr. Vail is going to give many men opportunities to fit themselves for this strenuous battle of life. One of his hobbies has been to encourage farmers' sons to stay on the farms. He has lured many an unsuccessful country boy away from city careers to the farm. At the Lyndonville Institute, which he founded, there are at present 300 boys and girls, all learning, as he said, 'to become boys and girls for life.'

Holding Boys on Farms.

"'I have a real school here in Vermont,' Mr. Vail said, 'and the boys are expected to go back to the land. That is where the real wealth of the country lies, and I want the boys to share in it. I am educating them to be good farmers.'

"Sometimes, when Mr. Vail becomes reminiscent, he talks of the early days when he studied medicine under the direction of his uncle.

"'Had I remained in my uncle's office,' he said, 'I imagine I should now be a country doctor. Still, I have often said that the favorite employment of man is to speculate over what might have happened had he done something else.'

"Years ago, when Mr. Vail retired from the street railway business in Buenos Aires, he intended to retire from active business. He did not find time. The nearest he came to it was to take up farming as a recreation, a pursuit which his father wanted him to take up when his school days ended. Since 1893 Mr. Vail has had a country home at Lyndonville. Mr. Vail finds great pleasure on his farm.

"Mr. Vail some years ago turned his mind to scientific agricultural study, and he has maintained an experimental station at which the possibilities of the land are carefully tested. The neighborhood reflects the result of this work. New England pasture land, he thinks, demands sheep for its adornment. On the hills at Lyndonville graze the best herds of the district. On his 5,000-acre estate Mr. Vail also raises fine cattle."

Water Softener Effects Economy in Central-Station Plant.

A water softener recently installed at the power plant of the Mineral Point Public Service Company is giving excellent satisfaction.

After using the soft water in the boilers for a month, one of the boilers was opened and it was found that all the scale had disappeared, leaving the black iron clean. When the soft water was started, the tubes contained three-sixteenths inch of very hard scale.

The water being treated contains 22 grains per gallon of incrusting solids and daily tests of the softened water show from 4 to 5 grains per gallon.

As would be expected, several leaks were opened up in the boilers, which required calking, due to the elimination of the scale.

It also appears that a saving in coal of $350 for the month of June over the month of May has been made, even with an increased load in June over May of 23,550 kilowatt-hours generated. In other words, this is a decrease of 7.9 per cent in the coal bill, with an increase of 5.5 per cent in the load.

The softened water is also used with great satisfaction in the turbine glands, which have previously given much trouble from scaling and thus preventing sealing.

The Mineral Point & Northern Railway is also using this water in its locomotives with good results.

An interesting feature of the water

softener installation is that it is used for a feed-water meter. The water is delivered to the softener through an orifice at a controlled constant head, and the orifice is calibrated. By means of a recording voltmeter attached to the softener operating float, the number of minutes per day that the softener operates is recorded. It is necessary to make a correction for the exhaust steam condensed in the heater, which is done by a calculation of the interchange of heat units, based on the temperatures of the water entering and leaving the feed-water heater. This requires on an average in the Mineral Point plant 11.5 per cent of the water fed to the heater from the softener. So far, no bad foaming has taken place, and it may be said that the softener has fully met the hopes of the operators.

The softener was installed and is operated under the direction of H. G. D. Nutting, public utility expert and engineer, Milwaukee, Wis.

Wireless in Australasia.

A scheme for connecting Australia and the Pacific Islands by wireless telegraphy was formulated some years ago by representatives of Australia and New Zealand. The High Commissioners for the Western Pacific, Fiji, the Admiralty, and the Pacific Cable Board, met in conference at Melbourne in 1909 to consider a scheme which received the approval of the Commonwealth Government, and which comprised the erection of stations at Sydney, Doubtless Bay (New Zealand), Suva (Fiji), Ocean Island, Tulagi (Solomon Islands), and Vila (New Hebrides). The scheme was, however, not approved by the Imperial Government and no further concerted action was taken, but the majority of the stations recommended have since been erected by the Governments interested. A Commonwealth scheme of wireless telegraphy includes three high-power stations for long-distance communication, and seventeen low-power stations, at such intervals round the coast as to allow intercommunication from ship to shore. The high-power stations at Sydney and Perth are open for traffic, and are worked on the Telefunken system. Preliminary arrangements have been made for the erection of a third power station at Darwin, capable of communicating with Singapore. The following low-power stations, with the exception of Roebourne and Wyndham, are now in operation, and are worked under the Balsilie system: Victoria—Melbourne; Queensland—Brisbane, Rockhampton, Cooktown, Thursday Island, and Twonsville; South Australia—Adelaide and Mount Gambier; Western Australia—Geraldton, Roebourne, Broome, Wyndham, and Esperance; Tasmania—Hobart and Flinders' Island; Northern Territory—Darwin; and Papua—Port Moresby. It is intended to increase the number of stations to 32.

Coking of Coal at Low Temperatures.

In view of the importance now attaching to by-products from the increasingly used distillation and recovery process for making coke, the following summary of an investigation conducted at the Engineering Experiment Station, University of Illinois, by S. W. Parr and H. L. Olin, is of special interest.

Coke resulting from the low-temperature process contains from 18 to 22 per cent of volatile matter but retains none of the tar-forming constituents. In domestic appliances it kindles readily and burns with a bright, smokeless flame. A suction-gas-producer test made with this fuel compared favorably in ease of operation and efficiency with similar tests of anthracite.

The tar has a specific gravity of 1.069, contains less than 2 per cent of free carbon and is rich in low-boiling substances, many of which are suitable for use in internal-combustion engines. Its adaptability to wood-preservation processes is shown by its high content of tar acids, which constitute nearly 30 per cent of the crude material. The pitch residue amounts to 30 per cent and is low in precipitated carbon. Naphthalene is absent.

Results of these studies show that the coke, tar and gas have specific properties of especial value, and indicate that the process of coking at low temperatures could be established successfully on a commercial basis.

The full report on this investigation is published as bulletin No. 79 by the Engineering Experiment Station, and can be obtained on application to its acting director, C. R. Richards, Urbana, Ill.

New Municipal Electric Plant for Manchester, England.

Details have been made public of a big electrical scheme that is being promoted by the municipal authorities of Manchester, England. The local newspapers announce that the Local Government Board has agreed to the application of the authorities to borrow the sum of $2,104,615 for a new electricity generating station which is to be erected at Barton, near Manchester.

It is thought that perhaps the scheme in question might probably benefit American electrical concerns, as so many of the competing English firms are engaged in the manufacture of war munitions, and, in consequence they will possibly be unable to compete for the business.

BOOK REVIEWS.

"Applied Electrochemistry and Welding." By Charles F. Burgess and George W. Cravens. Chicago: American Technical Society. Cloth, 224 pages (5x8¼ inches), illustrated. Supplied by the Electrical Review Publishing Company, Inc., for $1.50.

This volume consists of two separate books bound together. Applied electrochemistry is treated by Dr. Burgess, who is one of the best authorities upon this subject in the country, but who is erroneously stated upon the title page to be professor at the University of Wisconsin, a position which he has not occupied since 1913. The various subjects which are taken up are necessarily treated briefly, but a good idea of electrochemical applications may be obtained from the descriptions and the numerous illustrations. About half of the pages are devoted to electric furnace work, and the remainder to electrolysis and electroplating.

The subject of welding, as treated by Mr. Cravens, covers not only electric welding, but other processes for attaining this end. The advantages of the electrical method are brought out and the features of the different systems are given with illustrations of the various welders put out by different manufacturers. A few figures are given on the necessary energy for arc welding, which are of value on account of the scarcity of such data. This portion of the volume is also profusely illustrated, and constitutes a very useful summary of the existing state of the art.

"Practical Applied Mathematics." By Joseph W. L. Hale. New York: McGraw-Hill Book Company, Incorporated. Cloth, 206 pages (4¼x7 inches), illustrated. Supplied by the Electrical Review Publishing Company, Inc., for $1.00.

This book was prepared for use by railroad-shop apprentices, and is a presentation of problems arising in shop work in the mechanical trades. The use of mathematics as a tool is shown. The material included has been made sufficiently broad to be useful in schools devoted to other trades and vocations, or even in the technical courses of public schools. There are 20 chapters, each dealing with a definite arithmetical subject, and the ground covered includes the mensuration of simple solids, elementary algebra and the extraction of cube root.

Electrical Exports to Argentine Republic.

May exports to Argentina from the port of New York included $63,000 worth of electrical supplies. To Brazil, there was sent in May from New York, $34,000 worth of electrical material and supplies.

New Electrical and Mechanical Appliances

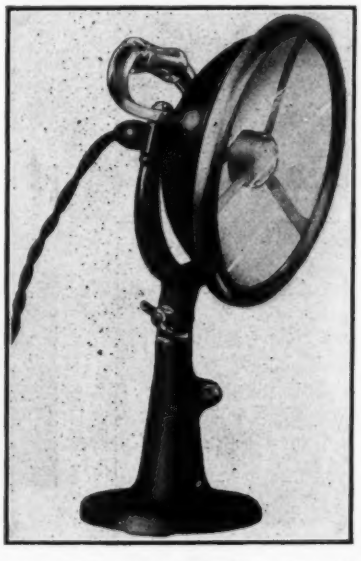
Electric Ditcher for Removing Track Obstruction.

An electrically operated ditcher and dump car was the "salvation" recently of the Kansas City, Clay County & St. Joseph Railway, in the predicaments resulting from heavy rains. The downpours had caused unprecedented slides, whole hillsides moving in cases as much as 14 feet and taking the track with them, or overflowing the rails. The situation was such that hand labor would require weeks to remove the obstruction, and traffic meanwhile would be seriously discommoded even when parts of the track were cleared. The company, however, had already purchased a ditcher and two dump cars from the American Hoist & Derrick Company, the ditcher being one of the first electrically operated machines to be put out by the company. This equipment was on hand, set up and ready to work when the slides came, and it was hurried out on the line. In two days it had cleared the track so that cars could get through; and it proceeded with the removal of threatening masses of earth while interurban schedules were maintained. The equipment, getting power from the trolley, and easily handled, could quickly be shunted to a side track on the approach of passenger cars. The ditcher has an Ideal motor, 1,200 volts, fed direct from the trolley wire. The side-dump cars, one in front and one behind the ditcher, are operated by compressed air from the work car which moves the ditching equipment. The ditcher takes bites of three-fourths of a yard, and loads 35 to 40 yards an hour; it loads and removes two dump cars between the hour-schedules of the passenger cars.

Electric Ditcher at Work.

New Searchlight for Use With Dry Cells.

There are numerous uses for a vehicle searchlight that may be operated successfully from dry-cell batteries. The new Pittsburgh searchlight, illustrated herewith, employs a powerful focusing lens in connection with an 8-inch parabolic reflector, which produces a beam of light with ample thrust for automobile and motorboat use for a current consumption of only one ampere, thus making it possible to use ordinary dry cells as the source of current supply. The lamp is a six-volt Mazda and can therefore be used with any six-volt lighting system, as well as with ordinary dry cells.



Bracket-Type Searchlight for Trouble Wagon.

Different types of brackets are furnished with the lamp, making it suitable for use on pleasure cars, motor trucks, motorcycles, motorboats, and trouble wagons. For automobile use it may be mounted on the door or wind shield. It not only serves as a searchlight for reading sign boards, turning and backing, but answers the purpose also of an auxiliary headlight for use in emergency cases. For motorcycles it affords a satisfactory headlight that can be attached to any machine without the expense of installing a lighting system.

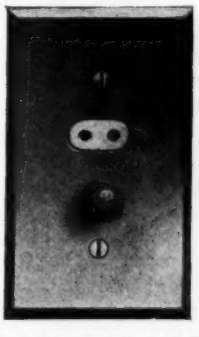
It enables the motorboat operator to pick out obstructions in any direction and at the same time affords him a strong light for landing. The motorboat outfit includes an extra bracket for mounting the lamp in the cabin when it is not required as a searchlight.

Its utility as a searchlight for trouble wagons will be apparent to central-station operators. This particular outfit consists of two brackets, one for mounting on the dashboard and another for use on the ground or wherever needed. The lamp gives ample light from its position on the ground or motor truck, for the use of a workman at the top of the tallest pole.

The lamp is manufactured by the Pittsburgh Electric Specialties Company, Pittsburgh, Pa.

Flush Wall Switch and Receptacle Combination.

The device illustrated herewith is primarily designed to provide an attachment-plug receptacle controlled by a switch, which can be installed complete in a regular flush outlet box. If the combination is installed with the feed wires coming through the switch end, it will control the device connected to the attachment plug, making it unnecessary to break the circuit by removing the plug. This permits a quick make and a quick break. The switch has an indicator which is especially valuable when it is used in connection with a device which of itself does not show whether current is being used.



Combined Receptacle and Switch.

This switch and receptacle combination may also be installed with the receptacle end toward the feed wires, when current can be taken off of the receptacle independently of the switch. In such a case the switch can still be

used for controlling other outlets. It is possible, therefore, to place one of these devices in a single outlet box previously used for a switch only, and take off current at this point by means of the receptacle unit. In some instances it will be found desirable to install this type of switch, even though it may not be anticipated that a receptacle will be useful at that particular point, as the face of the plate without the plug inserted is flush and the small black porcelain boss of the receptacle is not at all objectionable. In very many instances an outlet at a point where a switch has been installed is found convenient if only for temporary use and the plug with a cord and socket attached is often as desirable for a trouble lamp in the household as in the automobile.

This fitting is known as the Bryant type O switch and junior receptacle combination. It is manufactured by the Bryant Electric Company, Bridgeport, Conn.

Economical and Efficient Electric Hammer.

The "Do It Electrically" spirit of the present day has brought with it an entirely new set of conditions surrounding contracting work. In this electric age there is hardly a location where electric current is not available, and instead of making his power as he formerly did, the contractor buys it and applies it through motors at the most advantageous points.

Western Electric Hammer.

One of the special applications of electricity comes in the use of electric hammers, replacing the man with the sledge or hammer and star drill and the air compressor with its piping and hose.

The line of hammers that is being marketed by the Western Electric Company can be operated at a power cost that is practically negligible, ranging from two cents to five cents an hour and depending upon the size of hammer used. The equipment investment is small, only the first cost of the tool having to be considered.

To use one of these hammers it is only necessary to connect the tool to the nearest lighting outlet or wires. The low first cost of the equipment combined with the ease of operation, makes its use advantageous and practicable, not only where pneumatic tools have heretofore been used, but on a large class of work whose magnitude did not make it economical to install an air outfit.

A man with an electric hammer may be expected to do about as much work as six men working by hand. This is easily explained by the fact that a man with a hammer strikes from 50 to 80 blows a minute while the electric tools strike from 1,400 to 4,000.

These electric hammers have long since passed the experimental stage and are being used successfully by companies installing switchboards, pneumatic-tube systems, piping, railings, sprinkler systems, fire escapes, fire doors, etc. One large contractor tells of the great saving through the use of these tools in taking out the mortar between bricks for repointing, another of using them in breaking up old engine-bed foundations and sidewalks. Paint mills use them for dressing mill stones, ice plants and central stations for chipping scale off condenser tubes. In fact, wherever a rapid succession of blows makes for saving, these electric hammers are being used successfully.

Old Manual Sledge Method.

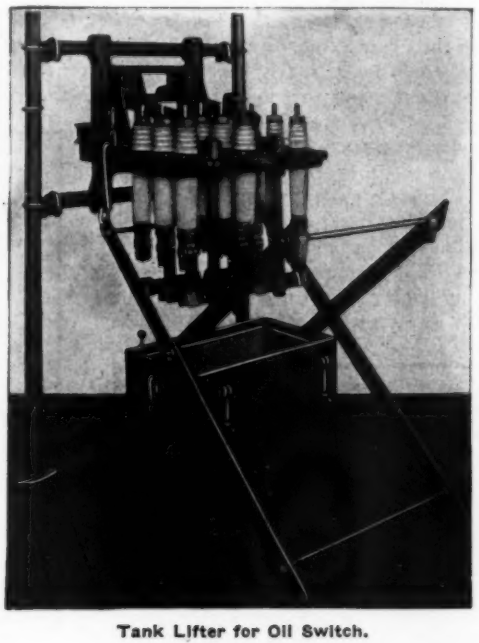
New Electric Hammer Method.

Tank Lifters for Small-Sized Oil Switches.

While a tank with oil for a comparatively small switch is not especially heavy, the character of the load makes it somewhat cumbersome for one man to manage. The result of this is that often the oil-switch contacts are not inspected as regularly as they should be to insure the most satisfactory operation. For this reason oil-switch tank lifters are a great convenience, particularly in stations where a large number of such oil switches are installed.

The tank-lifting arrangement manufactured by the General Electric Company provides a simple and easy means for lifting quickly an oil-switch tank either up or down the entire distance between the switch frame and the floor. The lifter is made in two widths, one for single and the other for double-throw switches, and differs only in the lengths of the three rods that join the parallel operating arms. This is necessary owing to the difference required in the dimensions of the oil tanks.

To fasten the tank lifter to the switch frame and lower the tank, two hooks attached to the inner ends of the longer pair of operating arms are placed over the ribs of the switch frame, the operating arms are raised and the tank supports fitted under the tank. Then the wing nuts that secure the tank to the frame are turned to unfasten the tank, and the arms are lowered to the floor. Finally two catches on the cross rod between the inner set of operating arms are released, and these arms are raised until the tank reaches the floor.



Tank Lifter for Oil Switch.

The tank supports are separate from each other and attach to the tank by continuations of the two equal sides of each strap-iron triangle, which are bent upward to fit over the rim on the bottom of the tank. Each support is removed from a tank by lifting an end of the tank a few inches from the floor and sliding the support from under. To place the tank on the oil switch, the operation is carried out in the reverse manner.

Underground-Conduit Exhibit of G. M. Gest.

Occupying about 900 square feet of floor space in the Palace of Machinery at the Panama-Pacific International Exposition, San Francisco, Cal., the exhibit of G. M. Gest, contracting conduit engineer, has attracted widespread interest, not only among those in engineering circles, but also every one interested in the betterment of street conditions in the cities by the removal of all overhead wires.

The exhibit comprises systems of underground conduit and cable construction, maintenance and operation, and is very instructive in showing all features of this branch of the electrical field. Not only are systems shown that are used in this country, but also many phases of methods used in other countries.

The exhibit shows the different materials, apparatus and methods of construction of underground conduit and cable systems, also distribution systems laid in solid, such as the armored cable and the Edison tube. Everything for the distribution of electrical energy, light and power, signaling and communication is present in a comprehensive form.

The various methods of installing underground conduit for draw-in systems are shown, including fiber, pump-log (creosoted wood), iron pipe, clay conduit in both single and multiple, square and round-bore type, also methods employed in Europe, including the one known as the trough system, in which either cast iron, asphalt or tile trough is used.

Manholes are represented for telephone, light and power cables, also the type of manhole used for transformers, usually called transformer vault. These are in brick and also in concrete construction. Shown complete are the various forms of apparatus for the proper distribution of electrical energy for the several systems, such as transformers, junction boxes, cutouts, switches and cable terminals, all installed as in actual operation. In addition to the different types of cable and other apparatus installed in the manholes are shown a street pillar and kiosk, also an ornamental lighting system with method of feeding by means of underground distribution system.

Augmenting the practical side of the underground work, drawings are shown of the plans for complete underground systems, also a collection of lantern slides showing special features of construction, also lighting systems in various parts of the country.

Having made a specialty of underground construction work for the past twenty years, Mr. Gest has been identified with many of the largest installations of conduit in this country and Canada. Operating from offices in New York, Cincinnati, San Francisco, Montreal, Winnipeg and Vancouver, there are few cities where this organization has not executed one or more contracts. At the present time they are engaged in installing several systems throughout the country.

In recognition of what Mr. Gest has done in developing conduit systems and for his methods of installation, the International Jury of Awards at the Exposition has awarded his American and Canadian organizations a gold medal the highest award in this special class.

Those who are looking for information along the lines of underground conduit construction, as well as ornamental lighting, should not miss any opportunity of seeing this interesting exhibit at the Expositton.

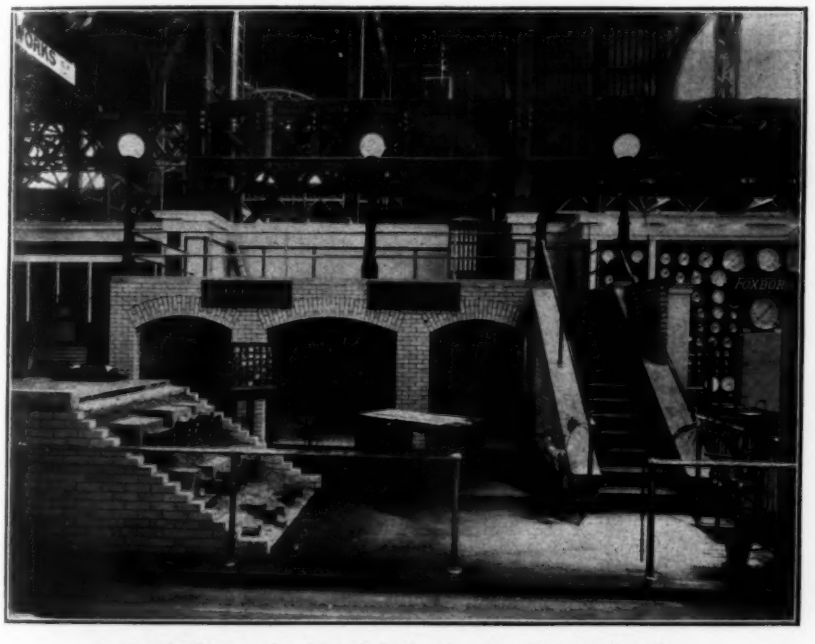


Exhibit of Underground-Conduit-Construction Engineering Firm.

Telephone for Use on Aeroplanes.

The rush of the wind and the deafening roar of the propeller practically prevent conversation between the pilot and the passenger in an aeroplane. A newly devised special telephone equipment makes such conversation possible, however.

The apparatus, which is called the "Aero-phone" and has been developed by the Western Electric Company, consists of two double-head telephone receivers and two special types of chest transmitters. The receivers are held against the ears by the spring headband so that practically all of the disturbing noises are excluded. The spring tension, however, is such so that the entire outfit is not uncomfortable. The special transmitters are provided with soft rubber caps, and are strapped to the chest at a point below the collarbone and above the third rib. In speaking, the chest muscles transmit the voice vibrations to the transmitter, thus enabling a telephone conversation to be carried on comfortably between the two occupants of the aeroplane.

Aviator Equipped With Aero-phone.

The receivers and transmitters are connected by suitable cords which terminate in a small plug. As the aviator or passenger takes his seat, the plug is inserted in a jack mounted in the framework of the aeroplane. One of these jacks is provided for each occupant. The battery required consists of three standard telephone dry cells

The Aero-phone in Use.

which will provide continuous service for 100 hours without any appreciable loss of transmission quality.

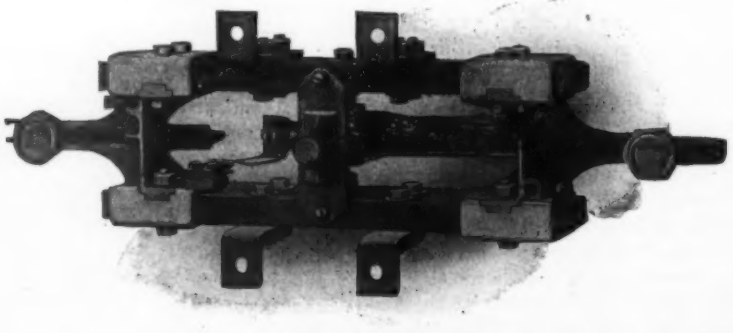
The simplicity and efficiency of this apparatus is sure to find favor in aviation circles, especially in the military branch of aerial work, modern aerial warfare having made it necessary that aviator and passenger be in communication at all times.

Automatic Trolley-Sectionalizing Insulator.

United States patent No. 1,126,092 has recently been granted to William Schaake, of the Westinghouse Electric & Manufacturing Company, on an automatic section insulator. These insulators are inserted in trolley wires where it is desirable to energize a section when the trolley passes onto it and to de-energize it when the trolley passes off. They are used extensively in mining installations where a branch is to be energized only when the locomotive is on that branch. Leakage losses and dangers of contact by persons passing under the trolley wire are thereby averted when the locomotive is not on the branch. Street-railway companies sometimes use them in the same way.

The circuit is opened and closed by a switch blade mounted on a rocker that the trolley operates. In one position the blade connects with copper contactors. In the other there is no connection. A brass plunger pressing against a steel roller gives a position-centering action and prevents the rocker from remaining in an intermediate position. There is no arcing at the switch contact, because the rocker is always energized and the switch connection is always opened or closed while the trolley wheel is on the rocker.

Side bars of impregnated hickory take the stress. All metal parts are either sherardized or of bronze. Wedges are used to hold the trolley wire and an internally threaded chuck, like that used in the Westinghouse Cleveland splicer, supplements these. A flexible woven-copper bond carries current to the switch blade on the rocker.



Top View of Trolley-Sectionalizer.

Effective Window Display of High-Efficiency Lamps.

An example of effective co-operation to boost electric-lamp sales ocurred a few months ago in Marinette, Wis. The Lauerman Brothers Company operates a large department store in that city and during the month of April conducted an educational advertising campaign on many lines of goods sold in the store which were not only manufactured in America but were of national reputation throughout the country. Special window displays were to form part of the scheme. One of the department managers, Robert E. Douglas, conceived the idea of making one of the these displays consist of Bryan-Marsh National Mazda lamps. He got in touch with A. E. Stadtbauer, of the well known electrical supply house of

Lamp Display in Store Window of Lauerman Brothers Company.

Julius Andrae & Sons Company, Milwaukee, Wis., which handles these lamps.

Through this co-operative effort, special display matter was sent to Marinette and the display installed in the window, as shown in the accompanying illustration. The window is 12 feet high, 16 feet wide and 7 feet deep. A 1,000-watt Photolite, the lamp specially adapted to photographic work, formed an important feature of the display. The photograph, from which the illustration herewith was reproduced, was made taken with this lamp at 8:45 p. m. April 19. The camera was placed 11 feet from the window and the exposure was 3 minutes and 43 seconds. This display attracted much attention.

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

INSULATING MATERIALS.—C. P. Lovering Company, East Cambridge, Mass.

Condensite and No. 1 Composition.

These molded insulating materials are practically non-absorptive; are not strictly non-combustible, but are not affected by continued moderately high temperatures; can be easily worked with tools; are of good dielectric strength and are unaffected by oils and acids.

Manufacturers desiring to use this material (for small parts of electric wiring devices, especially such as require considerable mechanical strength and durability as well as non-absorption and insulating properties of such materials as slate and marble) should submit samples in commercial form for tests.

Listed June 24, 1915.

PANELBOARDS. — Empire Engineering & Supply Company, 227 Fulton Street, New York, N. Y.

Panelboards shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, have labels attached.

Listed July 6, 1915.

PANELBOARDS.—Hatfield Electric Company, 102 Meridian Street, Indianapolis, Ind.

Panelboards shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, have labels attached.

Listed June 29, 1915.

PICTURE MACHINES AND APPLIANCES.—Feaster Film Feed Company, 687 Boylston Street, Boston, Mass.; Byron Chandler, Incorporated, sole representative, 1482 Broadway, New York, N. Y.

Feaster Film Feed Machine, a special horizontal upper magazine and reel so designed that by unwinding film from center of reel it can be repeatedly exhibited without rewinding it. Two types, for attachment, respectively, to Power's Cameragraph No. 6 A., made by the Nicholas Power Company, New York, N. Y., and to Simplex Projector, made by The Precision Machine Company, New York, N. Y.

Listed July 2, 1915.

PICTURE MACHINES AND APPLIANCES.—Precision Machine Company, 317 East Thirty-fourth Street, New York, N. Y.

Alternating-current motor for Simplex Projector made by Fidelity Electric Company, ⅛ horsepower, 110 volts.

Listed June 19, 1915.

RECEPTACLES, Standard.—H. T. Paiste Company, Thirty-second and Arch Streets, Philadelphia, Pa.

Paiste, 660 watts, 250 volts.

Conduit box, catalog Nos. 4251, 4253, 4255, 4257, 4258, 50721, 50722.

Listed July 6, 1915.

RECEPTACLES, Standard. — Pass & Seymour, Incorporated, Solvay, N. Y.

P. & S. brass-shell, closed or slotted bases. Key, 660 watts, 250 volts.

Cleat, catalog No. 613.

Concealed, catalog Nos. 615, 617, 618, 619 and 627.

Conduit box, catalog Nos. 601, 611, and 620-623 inclusive.

Molding, catalog No. 625.

Also above types with shadeholders attached; key type with composition or insulated metal key, or with "Shurlok" attachment.

Listed July 6, 1915.

RECEPTACLES, Standard.—V. V. Fittings Company, 1910 North Sixth Street, Philadelphia, Pa.

Keyless, 660 watts, 250 volts.

Conduit box, catalog No. 613 R.

Listed July 2, 1915.

ROSETTES, Fuseless.—V. V. Fittings Company, 1910 North Sixth Street, Philadelphia, Pa.

Conduit-box rosettes.

3 amperes, 250 volts, catalog No. 516 C, consisting of no-splice connection block, catalog No. 516, with blank or rosette cover, catalog No. 615. Also covers for same with ⅛-inch to ½-inch nipples, catalog Nos. 615M, 615F, 616M, 616F and 617M.

Listed Julv 2, 1915.

SHADEHOLDERS. — The Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins.

Uno shadeholders. These shadeholders are designed to thread over spiral socket shells, as supplied on Bryant or Perkins sockets and receptacles. Catalog Nos. 532, 535, 536.

Listed June 19, 1915.

SIGNS, Eletric.—P. Pause & Company, 404 West Erie Street, Chicago, Ill.

Electric signs shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, have labels attached.

Listed June 24, 1915.

SWITCHES, Automatic. — Allis-Chalmers Manufacturing Company, Milwaukee, Wis.

Pressure regulator switches, 40 amperes, up to 600 volts, direct or alternating-current, type O. B.

These devices are rated standard as being in compliance with requirements of the National Electrical Code. This rating is to be understood as indicating that in their construction the electrical fire hazard has been reduced to an acceptable degree. It is not to be construed as a recognition of the devices for use in connection with automatic sprinklers or similar fire protective equipment for which service their merits have not been investigated.

Listed June 23, 1915.

SWITCHES, Automatic.—Ingersoll-Rand Company of Illinois, 1505 Peoples' Gas Building, Chicago, Ill.

Double-pole, double-break, spring-controlled switch for use with motor-driven air compressors up to 5 horsepower, 250 volts. Switch is operated by air under control of a regulating valve. "Imperial."

These devices are rated standard as being in compliance with requirements of the National Electrical Code. This rating is to be understood as indicating that in their construction the electrical fire hazard has been reduced to an acceptable degree. It is not to be construed as a recognition of the device for use in connection with automatic sprinklers or similar fire protective equipments for which service their merits have not been investigated.

Listed July 2, 1915.

SWITCHES, Push-Button Flush.—Hydro Electric Specialty & Supply Company, 211 Yonge Street, Toronto, Ont.

Push-button flush switches shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, have labels attached.

Listed June 17, 1915.

SWITCHES, Push-Button Flush.—Hydro Electric Specialty & Supply Company, 211 Yonge Street, Toronto, Ont.

Single-pole, 5 amperes, 125 volts, catalog No. 9.

Three-way, 10 amperes, 125 volts, catalog No. 18.

Listed June 18, 1915.

SWITCH BOXES.—Wurdack Electric Manufacturing Company, 19 South Eleventh Street, St. Louis, Mo.

Pressed-steel switch boxes.

For use in mounting flush switches and receptacles and having detachable sides to facilitate assembly for use in gangs.

Listed June 21, 1915.

Current Electrical News

ATLANTIC STATES.

BROCKTON, MASS. — Henry W. Safford and others in the board of aldermen have filed a petition calling for a commission of five to investigate and report on a plan for a municipal plant for light, power and heat, with the exception that no power shall be sold for operation of an electric railway.

MIDDLETOWN, CONN.—The Waterbury Power Company is connecting this city with Berlin, Plainville, Southington and Waterbury by a high-voltage, overhead cable, which will be carried over steel towers about 100 feet high.

LAFARGEVILLE, N. Y.—The Public Service Commission has approved the application of the Lafargeville Electric Light Company to construct a power plant, and distribute electricity through the towns of Orleans and Theresa. The company was incorporated in 1908, the incorporation papers being broadened and amended last May. The management is about to extend the operation of the company into territory adjoining Lafargeville.

LEBANON, VA. — The Lebanon Light and Power Company has been organized to construct an electric light system.

KINSTON, N. C.—The city will expend $40,000 to improve the electric light system. Address mayor.

COOLIDGE, FLA.—The city will vote on August 16 on a proposition to issue $4,500 bonds to construct an electric light system. Address G. T. Knight, mayor.

NORTH CENTRAL STATES.

CINCINNATI, O.—City Electrician Kleine is preparing complete electric lighting systems for installation in the three city markets, beginning with the Sixth Street market, to take the place of the old gasoline torches which are still used. L.

STRASBURG, O.—The Public Utilities Commission has authorized the sale of the Strasburg Electric Company to the Ohio Service Company of Coshocton. The Ohio Service Company will pay $10,000 for the Strasburg property.

TIFFIN, O.—Attica, Bloomville and New Washington, villages of approximately 1,000 inhabitants, and each of which has a municipally owned electric light plant, are considering installing a central power house to supply the three towns with current. Attica, which is eight miles from each of the other villages and midway between them, would have the central power house. The towns would have 24-hour service, which they can not afford to have at present.

YOUNGSTOWN, O.—In connection with a considerable expansion in its plants, including the installation of two additional open-hearth furnaces and two tube mills, the Republic Iron and Steel Company will install at its Haselton plant a 2,400-kilowatt generator to provide the necessary additional current for the operation of the new units. L.

NORTH VERNON, IND.—Electrification of its furniture factory at this point has been decided on by the North Vernon Lumber Company, which will equip an isolated plant to generate the power. Generator, motors, etc., will be purchased. The company will add a 40 by 50 foot, two-story addition to the plant.

ROCKFORD, ILL.—The Rockford city council is investigating the matter of establishing a municipal electric lighting plant which will also furnish power to the city pumping station. Ross P. Beckstrom, superintendent of the water works department, has been instructed to make a report on the approximate cost of such a plant.

SPRINGFIELD, ILL.—Bids will be received by the State Board of Administration at the Capitol, Springfield, until 3 p. m., August 16, for electric wiring, motors and accessories at the Soldiers' Orphans' Home at Normal, Ill. Mrs. C. E. Bassett, acting managing officer of the home, has the specifications.

WARSAW, ILL.—The merchants and the council will install a white way. Address Mayor Marsh.

SPARTA, MICH.—$12,000 will be expended for an electric plant. Address town clerk.

HALLOCK, MINN.—The City Council is planning to install a $15,000 electric light system. Address village clerk.

ROCHESTER, MINN. — The common council and public utility board will advertise for bids soon on a new city electric lighting plant. Address A. F. Wright, city clerk.

BANCROFT, IOWA.—Bonds to the amount of $10,000 have been voted for an electric lighting plant. Address city clerk.

FARLEY, IOWA.—Elections held at Farley and Dyersville resulted in franchises being voted to the Easton Iowa Electric Company, Dubuque.

HAZELTON, IOWA.—The proposition to issue bonds for an electric light plant was carried. Address town clerk.

SAC CITY, IOWA.—On August 18 the citizens will vote on the proposition to issue $7,500 in bonds for the extension of the electric light wires from Lake View to Wall Lake so that the latter may be supplied with current from the Sac City plant.

CONCEPTION JUNCTION, MO.—The council is considering taking electric light and power service from the Maryville Electric Light & Power Company. Address town clerk.

SHELDON, N. D.—An electric lighting franchise has been granted to C. D. Udell, F. A. Barnard and E. L. Udell, all of Enderlin, and owners of the Enderlin Power & Heating Company. It is the plan of the Enderlin company to string wires across the country and furnish this city its light from the power house at Enderlin.

MOBRIDGE, S. D.—Gus Smith has sold his half interest in the Mobridge Electric Light, Heat and Power Company to B. S. Hill and J. W. Harris. Smith and Hill built the plant four years ago.

SEWARD, NEB. — The municipal light plant was struck by lightning and razed to the ground.

ATCHISON, KANS.—Muscotah has voted $8,000 in bonds to be used to build a power line which will carry electricity from Atchison to Muscotah. The line will be connected with the line which now runs from Atchison to Effingham. It is believed the lights can be turned on for the first time by October 1.

ROBINSON, KANS.—At a recent meeting of the city council it was decided to purchase current for the town's electric lighting system from Hiawatha, instead of installing a small plant in the town. A $10,000 bond issue was authorized for electric lights.

LOUISVILLE, KY.—The Market Street Improvement Association, an organization of retail merchants, which is maintaining an elaborate white way and doing other co-operative electrical advertising, has incorporated so as to carry out its mutual benefit work more satisfactorily. Arnold Levy, of Levy Brothers, is president. The company has no capital and the debt limit is $2,500.

SOUTH CENTRAL STATES.

OXFORD, MISS.—At the recent election, authority was given the commissioners to issue certificates of indebtedness to the amount of $6,500, to improve the light plant.

MARMADUKE, ARK. — The city has granted a franchise to the Crystal Ice Company, of Paragould, to furnish electric light and power.

KAPLAN, LA.—Bonds have been voted to install a municipal light plant.

BOSWELL, OKLA.—$14,000 will be expended for electric light plant. Address J. T. George, engineer in charge, Ada, Okla.

BRANDON, TEX. — The Texas Power and Light Company, of Dallas, will construct an electric lighting system here. Its power transmission line will be extended from Milford to this place. D.

LOCKHART, TEX.—E. B. Coopwood, a banker of this place, is at the head of a company that is being organized, to have a capital stock of $100,000, for the purpose of constructing an electric light and water works.

WESTERN STATES.

PROVO CITY, UTAH.—Plans whereby this city can have its own power plant and operate the same are under way and preliminary surveys have already been made by City Engineer Geo. C. Swan.

ALBION, IDA.—Preliminary steps toward the construction of a municipal lighting plant have been taken by the city council, and according to authentic information active construction will be undertaken early in the fall, providing a bond election to vote money to finance the improvement carries. The election will be held August 23. The proposed plant will cost about $10,000.

ST. ANTHONY, IDA.—The construction of a municipal lighting plant is being considered by the city council, and the council recently appointed a committee to confer with the Utah Power and Light Company with a view of purchasing a light plant of that company's in this city. According to reports, if the contemplated deal is made, extensions to the plant and additions to the distribution system will be made. O.

AZUSA, CAL.—The Board of Trustees has passed a resolution preparatory to placing ornamental lighting on certain streets of this city.

RIVERSIDE, CAL.—This municipality is considering rebuilding the old power plant of the Pacific Light and Power Company, which was recently burned, at a cost of $12,000. The cost of installing a transmission line from the present plant to the city substation would be $7,567.75.

SANTA BARBARA, CAL.—W. A. Brackenridge, of the Santa Barbara Gas & Electric Company, announces that his company will install conduits and ornamental lights along West Boulevard at a cost of $4,000.

SAUSALITO, CAL.—The town trustees have passed a resolution of intention preparatory to placing an electrolier system on a number of streets. A total of 65 standards with the necessary globes, lamps, etc., is involved.

JOSEPH, ORE.—The Wallowa Lake Amusement Company has applied for permission to take water from the Wallowa River to use in operating a small hydroelectric power plant.

PORT ORCHARD, WASH.—The Bremmerton-Charleston Light and Fuel Company has applied to the Board of County Commissioners of Kitsay County for permission to establish a transmission line along the county highways on Bainbridge Island.

REPUBLIC, WASH.—George S. Bailey has made application for an electric lighting and power franchise along the streets and other highways of this place.

PROPOSAL.

CONDUIT AND WIRING SYSTEM.—Sealed proposals will be received August 12 for furnishing and installing a conduit and wiring system and furnishing and installing interior lighting fixtures in the United States marine hospital at Cleveland, O. Address Jas. A. Wetmore, acting supervising architect, Washington, D. C.

FINANCIAL NOTES.

A special meeting of stockholders of the New England Telephone and Telegraph Company will be held on August 5, 1915, for the purpose of voting upon an increase in authorized capital stock from $50,000,000 to $75,000,000. The transfer books will be closed from Monday, July 26, to Thursday, August 5.

Dividends.

	Term.	Rate	Payable
Boston Elevated	Q	1.5 %	Aug. 5
East St. Louis & Sub. pf.	—	0.75%	Aug. 2
Jacksonville Trac.	Q	0.75%	Aug. 2
Kellog Switchboard	Q	3 %	July 31
Kings Co. Elec. Lt. & Pr.	Q	2 %	Sept. 1
Monongа. V. Trac. pf.	S	2.5 %	Aug. 2
National Carbon pf.	Q	1.75%	Aug. 14
Nev.-Cal. Elec. pf.	—	$2	Aug. 10
North American	Q	1.25%	Oct. 1
Ohio Traction pf.	Q	1.75%	Aug. 2
Pacific Pr. & Lt. pf.	Q	1.75%	Aug. 1
Sierra Pac. Elec. pf.	Q	1 %	Aug. 2
South. Calif. Edison	Q	1.5 %	Aug. 15
Tampa Elec.	Q	$2.50	Aug. 16
Texas Pr. & Lt. pf.	Q	1.75%	Aug. 2

Reports of Earnings.

PACIFIC GAS AND ELECTRIC COMPANY.

	1915	1914
June gross	$1,453,959	$1,358,083
Net earnings	670,367	556,128
Balance after charges	338,611	303,039
Surplus after division	324,917	163,012
Six months' gross	9,203,498	8,428,313
Net earnings	4,276,025	3,664,037
Balance after charges	2,119,181	1,309,493
Surplus after division	1,673,848	1,009,493
12 months' gross	17,687,873	16,413,577
Net earnings	7,926,070	6,339,636
Balance after charges	3,462,855	1,813,954
Surplus after division	2,703,338	1,213,954

CITIES SERVICE COMPANY.

	1915	1914
June gross	$ 294,520	$ 269,586
Net	280,497	260,369
Surplus after charges	239,663	231,472
12 months' gross	3,977,733	3,399,186
Net	3,829,563	3,308,202
Surplus after charges	3,339,562	3,010,139

CONSUMERS' POWER COMPANY (MAINE).

	1915	1914
June gross	$ 298,690	$ 255,055
Net	189,438	167,100
Balance after preferred dividends	61,393	47,343
Six months' gross	1,820,758	1,680,624
Net	1,243,170	1,120,510
Balance after preferred dividends	470,654	393,286
12 months' gross	3,555,536	3,297,579
Net	2,339,635	1,965,399
Balance after preferred dividends	809,542	534,091

DETROIT EDISON COMPANY.

	1915	1914
June gross	$ 541,561	$ 454,479
Net earnings	177,088	139,272
Surplus	89,402	70,618
Six months' gross	3,730,731	3,155,816
Net earnings	1,407,422	1,112,372
Surplus	900,036	702,745

CLOSING BID PRICES FOR ELECTRICAL SECURITIES IN THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	July 26	July 19
American Tel. & Tel. (New York)	121½	121
Commonwealth Edison (Chicago)	132½	134½
Edison Electric Illuminating (Boston)	234	235
Electric Storage Battery, common (Philadelphia)	52	53
Electric Storage Battery, preferred (Philadelphia)	52	53
General Electric (New York)	175⅛	166¾
Kings County Electric, (New York)	119	119
Massachusetts Electric, common (Boston)	5	5½
Massachusetts Electric, preferred stamped (Boston)	33	33½
National Carbon, common (Chicago)	135	130½
National Carbon, preferred (Chicago)	...	120
New England Telephone (Boston)	131	132
Philadelphia Electric (Philadelphia)	23⅝	23¾
Postal Telegraph and Cables, common (New York)	75½	70
Postal Telegraph and Cables, preferred (New York)	64	64
Western Union (New York)	68	69½
Westinghouse, common (New York)	106⅝	103½
Westinghouse, preferred (New York)	122	120

PERSONAL MENTION.

MR. RUPEN EXKSERGIAN AND MR. LEON H. WEBER have been appointed research assistants in the electrical engineering department of the Massachusetts Institute of Technology.

MR. FRANK C. AUSTIN, who until recently had charge of the West Penn Electric Light Company's station at Woodlawn, Pa., has been advanced to the superintendency of the Kittanning, Pa., district, with offices at that place.

MR. J. H. MITCHELL, superintendent of the meter department of the Columbus Railway, Power and Light Company, Columbus, O., has been appointed manager of the new-business department of the East St. Louis Light and Power Company, East St. Louis, Ill. Mr. D. C. Jones succeeds him at Columbus.

MR. C. D. WHEELER, advertising manager of the Fort Wayne Electric Works, of the General Electric Company, for the past six years, resigned his position July 17 to go with the Santo Manufacturing Company, Philadelphia, Pa., as advertising and assistant sales manager. This company manufacturers the well known Santo line of electric vacuum cleaners of the stationary, portable, and small sweeper types. Previous to entering the technical advertising field Mr. Wheeler was connected with different advertising agencies in Chicago.

C. D. Wheeler.

MR. ROBERT MONTGOMERY, commercial manager of the Louisville Gas and Electric Company, and Mrs. Montgomery, and R. E. Brian, manager of the Louisville branch of the Federal Sign System, Electric, and Mrs. Brian form a party of four which has gone for a motor boat trip up the Ohio River to the Kentucky River and on up the Kentucky River on an indefinite jaunt.

MR. B. M. DOWNS, general sales manager of the Hemingray Glass Company, Covington, Ky., who was obliged to submit to an operation about five weeks ago, has left the hospital, the operation having been attended with successful results. A host of friends and acquaintances of the genial "Bertram," well beloved of many in the electrical field, will be happy to know that he has returned to business, and expects to shortly be in better health than for many months.

MR. DAY BAKER, for several years New England manager of the General Vehicle Company, with offices at Boston, has been advanced to the position of manager of agency sales, foreign sales and the central-station department of the company. Mr. Baker has been one of the foremost electric-vehicle promoters in New England, and has made a host of friends. He has been, since its organization, treasurer of the Boston Commercial Vehicle Association, for four years president of the Boston Electric Motor Car Club and for three years treasurer of the New England Section, Electric Vehicle Association of America. Under his management the General Vehicle Company's business in New England territory has grown by leaps and bounds.

MR. WILLIAM E. MOORE, vice-president and general manger of the West Penn Traction Company, with which he has been associated since 1903, has resigned his office for the purpose of establishing a consulting engineering business in Pittsburgh, Pa. During the past twelve years that Mr. Moore served the company, the growth of the West Penn interests has been remarkable, the few railway lines and lighting plants which the company owned at the time Mr. Moore became identified with the properties having formed the nucleus of an interconnected railway, lighting and power transmission system, which today ranks among the first in the country in point of size, efficiency of service, progressivness and popularity with its patrons. The territory covered by the company's activities totals more than 3,000 square miles; the municipalities served with lighting and power number over 100; the industrial operations embrace electric drives in large steel mills, coal mines and miscellaneous manufacturing concerns. The gross income of the company, under Mr. Moore's direction, has grown from less than $500,000 to approximately $5,000,000 per annum. Mr. Moore will retain an advisory connection with the West Penn Company. While conducting a general engineering practice Mr. Moore will give special attention to electric railway, power and lighting business.

OBITUARY.

MR. JAMES P. McQUAIDE, one of the organizers of the National Conduit and Cable Company, of New York, died in England, on July 10, of heart disease. Mr. McQuaide retired from active business in New York City some 10 years ago and moved to England, where he purchased the historic mansion known as Pope's Villa, at Twickenham, and was residing there at the time of his death. Pope wrote his "Essay on Man" in this house, and at one time it was owned by Labouchere. Mr. McQuaide was quite widely known in electrical circles, beginning with the formation of the National Conduit and Cable Company in 1887. He and Mr. E. S. Perot, the present president of the company, were the organizers and today the company is one of the largest manufactarers of copper wires and cables in the United States, though starting with small capital and having to overcome many vicissitudes in the early development of the electrical industry.

DATES AHEAD.

American Association for the Advancement of Science. Summer meeting, San Francisco, Cal., August 2-7. Secretary, L. O. Howard, Washington, D. C.

International Association of Municipal Electricians. Annual meeting, Gibson Hotel, Cincinnati, O., August 24-27. Secretary, C. R. George, Houston, Tex.

Indiana Electric Light Association. Annual convention, Hotel Deming, Terre Haute, Ind., September 8-10. Secretary, T. Donahue, La Fayette, Ind.

Pennsylvania Electric Association. Annual convention, Bedford Springs, Pa., September 8-10. Secretary, H. N. Mueller, 435 Sixth Avenue, Pittsburgh, Pa.

Association of Iron and Steel Electrical Engineers. Annual convention, Hotel Statler, Detroit, Mich., September 8-11. Secretary, W. T. Snyder, McKeesport. Pa.

Northwest Section, National Electric Light Association. Annual convention, Portland, Ore., September 8-11. Secretary, N. W. Brockett, Pioneer Building, Seattle, Wash.

Association of Edison Illuminating Companies. Annual convention, Spring Lake, N. J., September 13-16. Secretary, George C. Holberton, San Francisco, Cal.

Electrical Supply Jobbers' Association. Quarterly meeting, Clifton Hotel, Niagara Falls, Ont., September 14-16. Secretary, Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

New England Section, National Electric Light Association. Annual convention, Mt. Kineo House, Kineo, Me., September 14-17. Secretary, O. A. Bursiel, 149 Tremont Street, Boston, Mass.

American Institute of Electrical Engineers. Panama-Pacific convention, San Francisco, Cal., September 16-18. Secretary, F. L. Hutchinson, 33 West Thirty-ninth Street, New York, N. Y.

American Electrochemical Society. Twenty-eighth general meeting, San Francisco, Cal., September 16-18. Secretary, Joseph W. Richards, South Bethlehem, Pa.

Illuminating Engineering Society. Annual convention, New Willard Hotel, Washington, D. C., September 20-23. Assistant secretary, Joseph Langan, 29 West Thirty-ninth Street, New York, N. Y.

International Engineering Congress, San Francisco, Cal., September 20-25. Executive secretary, E. J. Dupuy, Foxcroft Building, San Francisco, Cal.

Telephone Pioneers of America. Annual meeting, San Francisco, Cal., September 21-23. Secretary, R. H. Starrett, 15 Dey Street, New York, N. Y.

Southeastern Section, National Electric Light Association. Annual convention, Grove Park Inn, Asheville, N. C., September 22-24. Secretary, George H. Wygant, Tampa, Fla.

Colorado Electric Light, Power and Railway Association. Thirteenth annual convention, Glenwood Springs, Colo., September 23, 24 and 25. Secretary, Thomas F. Kennedy, 900 Fifteenth Street, Denver, Colo.

With the Electrical Manufacturers

Roller-Smith Company, 203 Broadway, New York City, has ready a series of new data sheets covering its complete line of direct-current and alternating-current instruments and circuit-breakers. These give dimension diagrams and data, as well as net and shipping weights.

Crouse-Hinds Company, Syracuse, N. Y., has issued Bulletin 1,000C. This gives a full list of all new and special Condulet fittings, each of which is illustrated and described. Special illustrations are given showing admirably the use of many of these Condulets. The bulletin contains 32 pages of valuable and systematically arranged information on these fittings.

The Standard Paint Company, Woolworth Building, New York City, has been awarded the Gold Medal, or highest award, by the International Jury of Awards at the Panama-Pacific Exposition, San Francisco, for the company's Impervite cement-waterproofing compound. This compound is an asphaltic emulsion and in the tests which preceded the San Francisco award, as well as in other similar tests, proved distinctively superior to competing compounds.

The Robbins & Myers Company, Springfield, O., has issued a booklet entitled "Flashes From a Live Wire." This is an illustrated account of an interview between the company's advertising manager, C. H. Clark, and the general superintendent of the Addressograph Company, J. P. Jackson. Several hundred Robbins & Myers motors are in use in the Addressograph factory, performing exacting service and they are installed on the machines put out by the Addressograph Company. Views of other typical machines operated by these motors are given, also an explanation of what is meant by Robbins & Myers service.

Westinghouse Lamp Company, 1261 Broadway, New York City, has issued Nos. 2 and 3 of its salesmen's lamp handbook series. No. 1 of this set was referred to in these columns several weeks ago. No. 2 is called "The Lighting Dictionary" and is a condensed glossary of electrical terms, particularly those met with in the incandescent-

lamp industry and in illuminating engineering. No. 3 is entitled "Modern Lighting Practice" and gives many valuable suggestions on the successful application of light prepared by a prominent lighting specialist. The branches particularly touched on are residence lighting, store lighting, and display-window lighting. A number of illustrations help to make these suggestions more clear. These salesmen's handbooks can be obtained free on application to the company, which is to be commended for getting up such an educational series.

DeLaval Steam Turbine Company, Trenton, N. J., has issued a 64-page book dealing with centrifugal blowers and compressors for all pressures from 5 inches of water, as in mechanical draft service, up to 125 pounds per square inch, as for compressed-air distribution in mines, machine shops, shipyards, etc. The development of the high-efficiency, high-speed centrifugal blower or compressor has followed improvements in materials, shop practice and design, such as are employed in the building of high-grade steam turbines. It is now possible to run blower and compressor wheels safely and satisfactorily at peripheral velocities of 450 to 600 feet per second. In the present publication numerous charts are given showing curves for the compression of air and characteristic curves of single and multistage blowers and compressors. The influence of impeller design upon the form of the characteristic is discussed. Particulars are given concerning the application of centrifugal blowers to various purposes. The illustrations show numerous examples of blowers and compressors directly connected to steam turbines and to electric motors.

Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa., reports the following orders recently received: Western States Gas & Electric Company, Placerville, Cal., one 1,875-kilowatt, 2,300-volt, three-phase, 60-cycle, water-wheel generator for an extension of the present plant. Union Light, Heat & Power Company, Fargo, N. D., two 1,875-kilowatt, 2,300-volt turbogenerator units. Consolidated Gas, Electric Light & Power Company, Baltimore, Md., one 6,825-kilovolt-ampere, synchronous frequency-changer set to take power from a 13,000-volt, 25-cycle line and transform it into 4,000-volt, 62.5-cycle energy; this set is practically a duplicate of a Westinghouse set now installed. Citizens Light & Power Company, Johnstown, Pa., one 6,250-kilovolt-ampere, 4,000-volt, 60-cycle, turbogenerator unit with necessary auxiliary equipment. Merchants Heat & Light Company, Indianapolis, Ind., one 6,250-kilovolt-ampere, 4,000-volt, 60-cycle, turbogenerator unit complete with auxiliaries. Counties Gas & Electric Company, Norristown, Pa., one 3,125-kilovolt-ampere, 2,400-volt turbogenerator unit complete with auxiliaries. The Hartford Electric Company, Hartford, Conn., two 2,500-kilovolt-ampere, single-phase, 60-cycle, 11,000-2,400-volt, forced-oil-cooled transformers. Ogden, Logan & Idaho Railway Company, Ogden, Utah, two stationary substations, each consisting of a 500-kilowatt motorgenerator set, direct-connected exciter; three 235-kilovolt-ampere, single-phase transformers, and a switchboard to control same; also a portable substation with similar equipment. Stevens County Power & Light Company, one 900-kilovolt-ampere, 11,000-volt, three-phase, 60-cycle, horizontal generator for water-wheel drive, direct-connected exciter; several high-tension transformers and a six-panel switchboard for the control of same. Tug River Power Company, Sprigg, W. Va., one 1,800-kilowatt, three-phase, 60-cycle, 3,400-volt, turbogenerator unit with direct-connected exciter; three 500-kilovolt-ampere, single-phase, 33,-000-2,300-volt transformers and 21 smaller, single-phase, 60-cycle transformers. Toledo Railways & Light Company, Toledo, Ohio, one 20,000-kilowatt, three-phase, 25-cycle, turbogenerator unit; one 25,000-square foot surface condenser with auxiliaries; two 2,000-kilovolt-ampere, single-phase, 60-cycle, 33,000-4,000-volt transformers. Public Service Electric Company, Newark, N. J., one 1,000-kilowatt, 600-volt direct-current, six-phase, 60-cycle, rotary converter; three 365-kilovolt-ampere, air-blast, single-phase, transformers; one 350-kilovolt-ampere, single-phase, 60-cycle, 60,000-2,000-volt testing transformer; one 350-kilovolt-ampere, single-phase, 60-cycle, 2,000-440-volt regulating transformer; one 2,500-kilovolt-ampere, single-phase, 30,-000-volt inductance coil. Northern Virginian Power Company, Worcester, Va., one 900-kilovolt-ampere alternator, vertical water-wheel type, three-phase, 60-cycle, 6,600 volts. Lackawanna & Wyoming Valley Railroad Company, Scranton, Pa., five 200-kilovolt-ampere, single-phase, 25-cycle, 22,000-440-volt transformers.

Record of Electrical Patents

Issued by the United States Patent Office, July 13, 1915.

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,145,881. Door-Operating Mechanism. J. S. Doyle, assignor to Consolidated Car Heating Co., New York, N. Y. Motor-operated sliding door with limit switch.

1,145,899. Ammunition Hoist. J. D. Ihlder, assignor to Otis Elevator Co., Jersey City, N. J. Motor-driven gearing for hoisting ammunition and adjusting gun inclination.

1,145,900. Hydro-Extractor or Like Centrifugal Machine. T. K. Irwin, London, England. Dynamo driven by impulse rotor of centrifugal hydro-extractor.

1,145,901. Electric Signaling Apparatus. O. G. H. E. Kehrhahn, New Rochelle, N. Y. Special structure of rotatable contactor for producing flashes.

1,145,911. Controller for Door-Motors. J. F. McElroy, assignor to Consolidated Car-Heating Co. Electromagnetic control of fluid-operated door motor.

1,145,914. Elevator. A. Magnuson, assignor to Otis Elevator Co. Taut wire extends along hatchway and guides slack conductors running to car.

1,145,926. Brush for Dynamo-Electric Machines and the Like. E. O. Schweitzer, Chicago, Ill. Carbon brush has lubricating device.

1,145,940 and 1,145,942. Relay. N. H. Suren, assignor to Gamewell Fire Alarm Telegraph Co., New York, N. Y. Different structures wherein switch operated by magnet armature opens after predetermined time, if armature remains retracted.

1,145,941. Fire-Alarm-Telegraph System. N. H. Suren, assignor to Gamewell Fire Alarm Telegraph Co. Local receiving circuit controlled by relays as above, transmitter breaking relay circuit for several different periods of time.

1,145,950. Galvanic Cell. S. M. Ward, Jr., assignor to Hall Switch & Signal Co., New York, N. Y. Container is negative electrode and lined with insulation except at one spot, and insulating barrier between exposed spot and positive.

1,145,976. Supervisory System for Telephone Lines. W. W. Dean, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Supervisory relay energized by cord connection to display signal and further energized on use of subscriber's instrument to render signal inoperative.

1,145,977. Electric Heater. H. W. Denhard, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. For chafing dish; has means for raising and lowering.

1,145,978. Telephonic Transmission-Circuit. H. G. Dorsey, assignor to Western Electric Co., New York, N. Y. Telephonic relay and shunt circuit resonant to frequencies above maximum telephonic.

No. 1,146,118.—Entrance Fitting.

1,145,988. Electric Heater. W. S. Hadaway, Jr., New Rochelle, and E. N. Lightfoot, New York, N. Y. For heating bottom of liquid receptacle, especially percolator.

1,146,002. Telephone System. E. Land, assignor to Kellogg Switchboard & Supply Co. Relates to automatic trunk connections.

1,146,064. Electric Circuit-Controlling Switch. E. Oppenheim and T. J. Burns, Rockford, Ill. Arrangement for operating and locking sets of contacts in series.

1,146,019. Vacuum-Producing Method and Means. A. H. Pfund, Baltimore, Md. High-potential alternating current discharges caused between metal and gas-absorbing material to restore or accentuate vacuum.

1,146,040. Trolley Head. W. Volpe, Philadelphia, Pa. Is provided with guard wheels.

1,146,049. Telegraphy. W. M. Bruce, Jr., Springfield, O. Current impulses of equal duration but opposite polarity transmit message and resistance is varied as time interval between impulses is changed.

1,146,064. Electric Circuit - Controlling Switch. W. E. Gorton, assignor of one-half to W. F. Hoffman, St. Joseph, Mo. Oscillating, quick-break switch.

1,146,067. Check-Controlled Music-Playing Device. P. Hansel, assignor to Ludwig Hupfeld Aktiengesellschaft, Böhlitz-Ehrenberg near Leipzig, Germany. Electrical means for positioning the note records.

1,146,074. Telephone-Exchange System. M. L. Johnson, assignor to Frank B. Cook Co., Chicago, Ill. Semi-automatic.

1,146,075. Process of Treating Zinc-Bearing Materials. W. McA. Johnson, assignor to Continuous Zinc Furnace Co., Hartford, Conn. Electric furnace used in treatment of ores containing lead and zinc.

1,146,082. Authorizing Method and System. J. J. Leidigh, assignor to National Cash Register Co., Dayton, O. Credit-authorizing system comprising punching mechanism at substations electrically operated from central stations with signaling means, etc.

1,146,084. Electric Current Tap. C. D. McLean and G. H. Holt, Berlin, N. H. Lateral tap in lamp socket.

1,146,113. Accounting System. C. H. Tallmadge, assignor to W. R. Heath, Buffalo, N. Y. Electrically operated indicating and printing registers with decumulating and accumulating mechanism, respectively.

1,146,118. Entrance Fitting or Pipe Cap for Electric Service Pipes or Conduits. W. D. Woolley, assignor to Killark Electric Mfg. Co., St. Louis, Mo. Overhangs to prevent moisture entering. (See cut).

1,146,140. Magnetic Separation or Ore.

F. B. Dutton and B. E. McKechnie, assignor to Pennsylvania Steel Co., Philadelphia, Pa. Material is magnetically separated beneath water, into which it is fed and from which magnetic material is carried by belt.

1,146,141. Magnetic Separator. F. B. Dutton and B. E. McKecknie, assignors to Pennsylvania Steel Co. Electromagnetic apparatus for carrying out above process.

1,146,142. Process of Chlorinating Aromatic Hydrocarbons Including Toluol. C. Ellis, assignor to Chadeloid Chemical Co. New York, N. Y. Ultra-violet light is employed in making benzyl chlorid.

1,146,151. Electric Time-Switch. W. B. Garrett, Thermopolis, Wyo. Details of clockwork-operated switch.

1,146,164. Electrically Heated Apparatus. T. Hoock, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Cooking device with heat storage.

1,146,165. Electromagnetic Controlling Device. W. K. Howe, assignor to General Railway Signal Co., Gates, N. Y. For signal-setting motors, the current through motor being decreased when signal is set.

1,146,167. Circuit-Breaker. D. B. Hughes, assignor to Citizens Savings & Trust Co., Cleveland, O. Details of cam-operated switch.

1,146,172. Variable - Rate Integrating Electricity Meter. V. Karapetoff, assignor to Chicago Electric Meter Co., Chicago, Ill. Multiple-rate meter controlled by maximum demand.

1,146,177. Telephone System. E. Land, assignor to Kellogg Switchboard & Supply Co. Relates to automatic selecting switch.

1,146,189. Insulating Material. H. B. MacFarland and R. Shoemaker, said Shoemaker assignor to said MacFarland, Chicago, Ill. Mixture of fibers of *zostera marina* and hydrocellulose derived from such fibers made into a felted sheet.

1,146,190. Method of Producing Insulating Material. H. B. MacFarland and R. J. Shoemaker, said Shoemaker assignor to said MacFarland. Treatment to form above.

1,146,201. Electric-Wire Insulator. S. Nunn, Portland, Ore. Details of pin insulator.

1,146,203. Trolley - Wheel Mount. S. Parent, Adams, Mass. Details of harp.

1,146,204. Electric-Signal Switch. W. A. Pearce, Virginia, Minn. Particular structure of rotary drum controller.

1,146,212. Compound for Treating Lumber. J. P. Sullivan, Memphis, Tenn., assignor of E. E. Bookmiller. For coating the electrode-engaging surfaces of timber to be electrically treated.

1,146,214. Protective Coating and Method of Applying Same. C. P. Townsend, Washington, D. C. Electrolytic method of coating conductors with a phenolic condensation product.

1,146,234. Telegraphy. W. M. Bruce, Jr., assignor to United Telegraph & Cable Co., Springfield, O. Signals transmitted by characters having their beginnings and ends marked by impulses of equal duration but of opposite polarities respectively.

1,146,242. Game. W. F. Garaughty, Columbus, O. Switches in pockets of pool table, and closed by balls therein, control buzzer circuit.

1,146,268. Headlight. F. F. MacLean, Syracuse, N. Y. Converging reflector with electric lamp, whose bulb has selected parts translucent and other parts transparent.

1,146,274. Printing-Telegraph Apparatus. F. D. Pearne, Chicago, Ill., assignor of one-half to J. E. Martine. Keys control relays governing connections to the line of impulse circuits of different characteristics.

1,146,292. Therapeutical Electrode. R. H. Wappler, assignor to American Cystoscope Makers, Inc., New York, N. Y. Adapted for insertion into the body.

1,146,294. Contact Mechanism for Electric Alarm Systems. J. P. Williams, assignor to Duplex Electric Co., New York, N. Y. An operating bar common to several depressible contacts may be swung out of operating position.

1,146,298. Insulating Support for Storage Batteries. C. Ambruster, Roslyn, Pa. Details of structure of glass insulator mounted on earthenware pedestal.

1,146,300. Method of Forming Phenolic Condensation Products. J. W. Aylsworth, assignor to Condensite Co. of America, Glen Ridge, N. J. Details of process for obtaining a condensation product from phenol and a methylene-containing substance.

1,146,310. Electrically Heated Apparatus. O. A. Colby, assignor to Westinghouse Electric & Mfg. Co. A cook stove has a container for material kept fluid by electric heat and admitted to and withdrawn from the different heating surfaces as desired.

1,146,320. Automatic Timing Device. A. L. Fish, Flushing, N. Y. Stop watch electrically controlled by the gases from the starting pistol and by a passing racer.

1,146,323. Device for Producing Images. H. S. Gay and E. W. Duke, assignors to Stereo-Annunciator Co., Los Angeles, Cal. Electrical slide-operating mechanism for projectors.

1,146,325. Connecting Device. D. D. Gordon, assignor to Yost Electric Mfg. Co., Toledo, O. Structure of attachment plug for sliding insertion and locking in usual screw-threaded socket.

1,146,326. Switching Device. D. D. Gordon, assignor to Yost Electric Mfg. Co. Structure of quick-movement pendent switch.

1,146,328, 1,146,329 and 1,146,330. Electrically Heated Apparatus. T. Hoock, assignor to Westinghouse Electric & Mfg. Co. First patent, electric cooking range having electrically heated heat-storing body in a heat-insulated chamber. Second patent, modification with heat conductors from storage body to hot plates. Third patent, modification having structure for bringing cooking utensil into association with storage body.

1,146,339. Draft Mechanism. S. J. Matthews, Port Clinton, O. Gear-driven by electric motor inclosed in the housing.

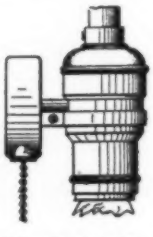
1,146,340. Remote-Control Switch. W. S. Mayer, Taunton, Mass. Electromagnetically opened and closed.

1,146,348. Electrical Conductor. F. H. Pritchard, assignor to General Electric Company, Schenectady, N. Y. Conductor rectangular in cross-section and subdivided to prevent deleterious induction.

1,146,361. Illuminated Sign. W. H. Spencer and H. C. Storm, assignors to G. F. Spencer, New York, N. Y. Line-filament lamp in a housing into which fits edge of transparent sign plate.

1,146,371. Computing-Machine. J. N. Thornton, assignor to J. T. Underwood, Brooklyn, N. Y. Driving-motor controlling switch interlocked with control of clutch for connecting motor to mechanism.

1,146,434. Egg-Testing Device. T. McLaughlin, assignor to G. V. Carrol, Chicago, Ill. Arrangement of reflector, lamp and egg-holder.



No. 1,146,485.—Socket-Key Operator.

1,146,471. Lamp-Globe Fixture. C. Bertram, assignor to Morreau Co., Cleveland, O. Semi-indirect, with special spider supporting bowl and lamp sockets.

1,146,485. Electric-Switch Operator. J. F. Dunn, New York, N. Y. For attachment to lamp-socket key to operate same always in one direction by endless cord. (See cut).

1,146,486. Electrical Instrument for Electrically Transmitting Indications. M. Dürr, assignor to Siemens & Halske A. G., Berlin, Germany. Resistance device wherein indicator is electromagnetically depressed at intervals to contact with resistance arranged in ring about pivot and thus close circuit of a measuring device.

1,146,498. Arc Light. G. Humber, Denver, Colo. Holders for downwardly converging carbons in separate brackets and electromagnetic means for swinging the brackets toward or away from each other according to current flow.

1,146,518. Electric-Resistance Element. J. R. Quain, London, England. Heating element; resistance kept from air by inclosing in annular, integral chamber of silica.

1,146,535. Sound-Transmitting Member. L. Steinberger, New York, N. Y. Handgripped part of telephone-receiver casing a sonorous body with external ribs.

1,146,563. Laying-Frame for Plate Glass. W. J. Golightly, assignor to Pittsburgh Plate Glass Co., Pittsburgh, Pa. Mounting of motor that swings frame.

1,146,574. Controller for Automatic Musical Instruments. A. Jameson, assignor to F. R. Henshaw, Indianapolis, Ind. A hand-piece manipulator having contacts for electrical control.

1,146,577. Hydraulic Brake. S. H. Keefer, assignor to Niles-Bement-Pond Co., Jersey City, N. J. Electromagnetically controlled.

1,146,581. Synchronous Telegraphy. E. W. Larsen, Minneapolis, Minn. For maintaining synchronous operation of pair of sunflowers.

1,146,583. Automatic Telephone - Exchange System. F. R. McBerty, assignor to Western Electric Co. Registering and controlling equipment at exchange and means for preventing interference with it by other calling lines when in use by one.

1,146,588. Automobile Signal-Light. J. F. Miller and C. J. Locke, Detroit, Mich. Structure having electromagnetically operated shutter and incandescent lamp.

1,146,592. Resistance. E. F. Northrup, Princeton, N. J. Non-inductive unit comprising superimposed, flat, spirally and oppositely wound coils in parallel.

1,146,616. Safety Device for Electric Signaling Apparatus. A. C. Farrand, assignor to H. W. Johns-Manville Co., New York, N. Y. Operator protected by insulation covering operating member and outside of coating being grounded.

1,146,623. Electrically Heated Apparatus. T. Hoock, assignor to Westinghouse Electric & Mfg. Co. Cooking range comprising heat-storage and heat-insulated body with arms extending to cooking points and means for regulating the heat distribution.

1,146,626. Portable Electric Light. I Koretzky, assignor to L. J. Morrison, New York, N. Y. Special structure of push-button preventing loss of plunger.

1,146,637. Thermostat. R. F. Massa, assignor to H. W. Johns-Manville Co. Contact moved by thermostatic member into and out of attractive region of magnet tending to close circuit.

1,146,661. Trolley Pole. C. O. Shaub, Dayton, O. Has guards for preventing wheel jumping wire.

1,146,679. Oil-Vaporizer for Combustion Engines. A. Winton, assignor to Winton Gas Engine & Mfg. Co., Cleveland, O. Electrically heated vaporizer.

1,146,717. Insulator for High-Voltage Electric-Cable Splices. F. Klenk, Mount Vernon, N. Y. A solid core of insulating material has grooves to receive the splices, respectively, and a sleeve covers them.

1,146,730. Block-Leveler. J. G. Osgood, and F. W. Bachman, Cincinnati, O., assignor to J. G. Osgood. Arrangement of driving motor and cutter shaft.

1,146,734. Electromagnetic Circuit-Closing and Circuit-Breaking Device. A. Pick, assignor to Van Dorn Electric Tool Co., Cleveland, O. Details of relay.

1,146,752. Telegraphy. P. B. Delany, assignor to Telepost Co., New York, N. Y. Tape controlled and recording; receiving perforator retransmits into another circuit.

1,146,758. Curling-Iron Heater. W. S. Hadaway, Jr., New Rochelle, N. Y. Heating circuit closed by insertion of iron.

1,146,767. Means for Driving Centrifugal Machines. M. H. Barker and C. A. Adams, assignors to American Tool & Machine Co., Boston, Mass. Motor switch moved to open position when brake is set.

Patents Expired.

The following United States electrical patents expired on July 26, 1915:

607,830. Device for Operating Electric Switches. J. H. Cary, Springfield, Mass.

607,918. Crossover for Trolley Systems. C. E. Davis, Chicago, Ill.

607,919. Electric Tramway. A. Diatto, Turin, Italy.

607,921. Electrical Measuring Instrument G. K. Elphinstone, London, and A. C. Heap, Penn, England.

607,989. Interior Conduit. E. E. Erickson and F. W. Erickson, Boston, Mass.

607,992. Igniter for Gas Engines. R. B. Hain, Grand Rapids, Mich.

607,994. Microphone. T. J. Howell, London, England.

607,997. Electrically Self-Propelling Vehicle. L. Krieger, Paris, France.

608,013. Reversing Rheostat. I. E. Storey, Philadelphia, Pa.

608,015. Secondary Battery. G. Walter, Strasburg, Germany.

608,076. Electric Telephone System for Houses. L. Plaut, New York, N. Y.

608,088. Insulated Rail Joint. G. A. Weber, New York, N. Y.

608,104. Electric Sounding Device for Ships. J. P. Buckley, New Orleans, La.

608,109. Electric Light for Surgical Purposes. W. E. Dow, Braintree, Mass.

608,132. Electrostatic Measuring Instrument. J. F. Kelly, Pittsfield, Mass.

608,133. Means for Preventing Stray Magnetism in Dynamo-Electric Machines. J. F. Kelly.

608,134. Electrical Circuit-Controller. R. Lundell, New York, N. Y.

608,135. Commutator Brush-Holder for Dynamo-Electric Machines. R. Lundell.

608,137. Electric Motor for Electrically Propelled Vehicles. A. Siemens, London, England.